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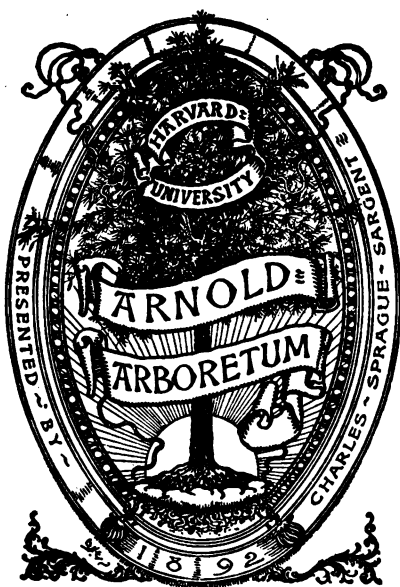
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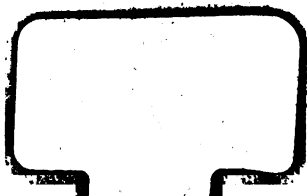
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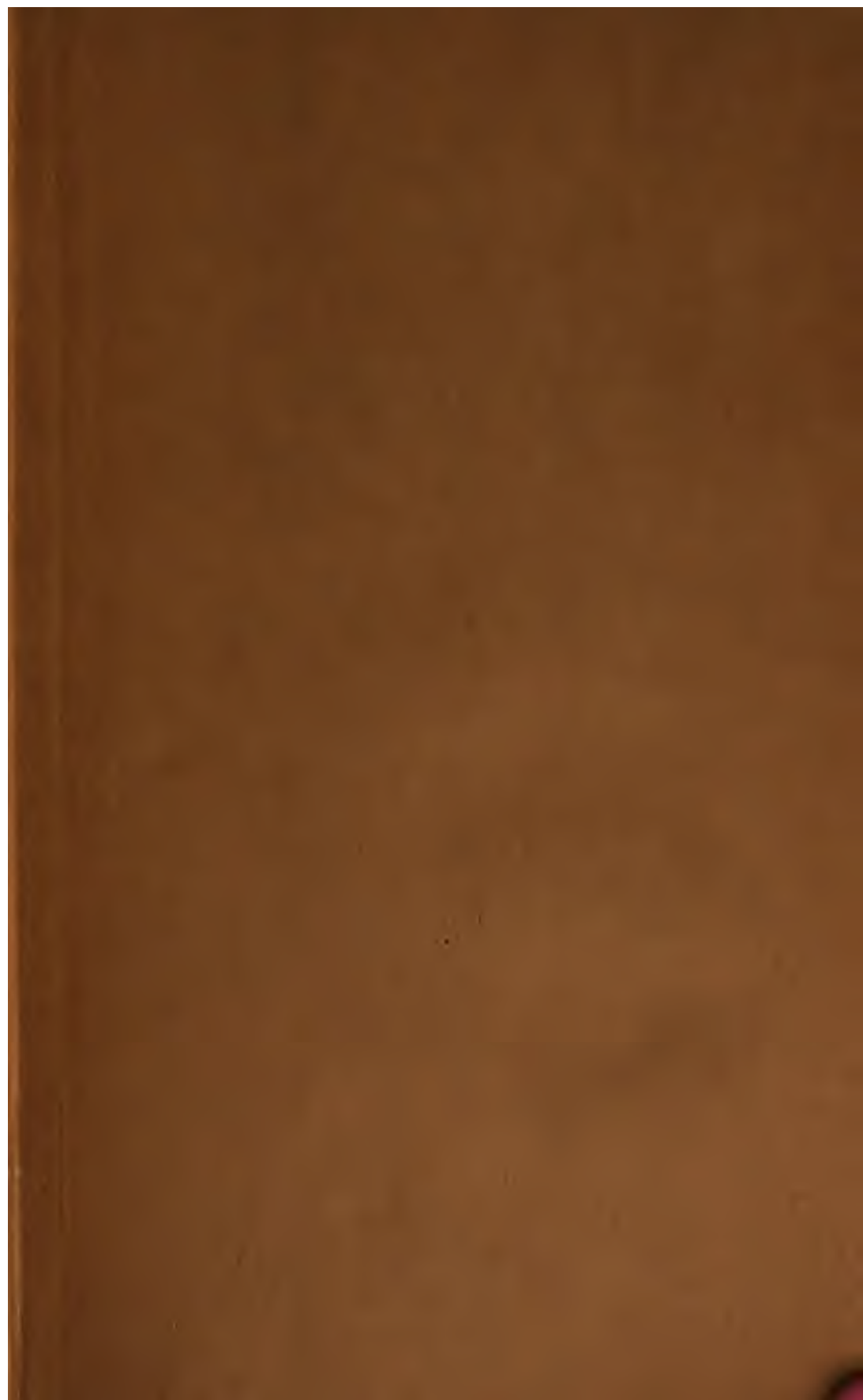
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DEPOSITED AT THE
HARVARD FOREST
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RETURNED TO J.P.
MARCH, 1967







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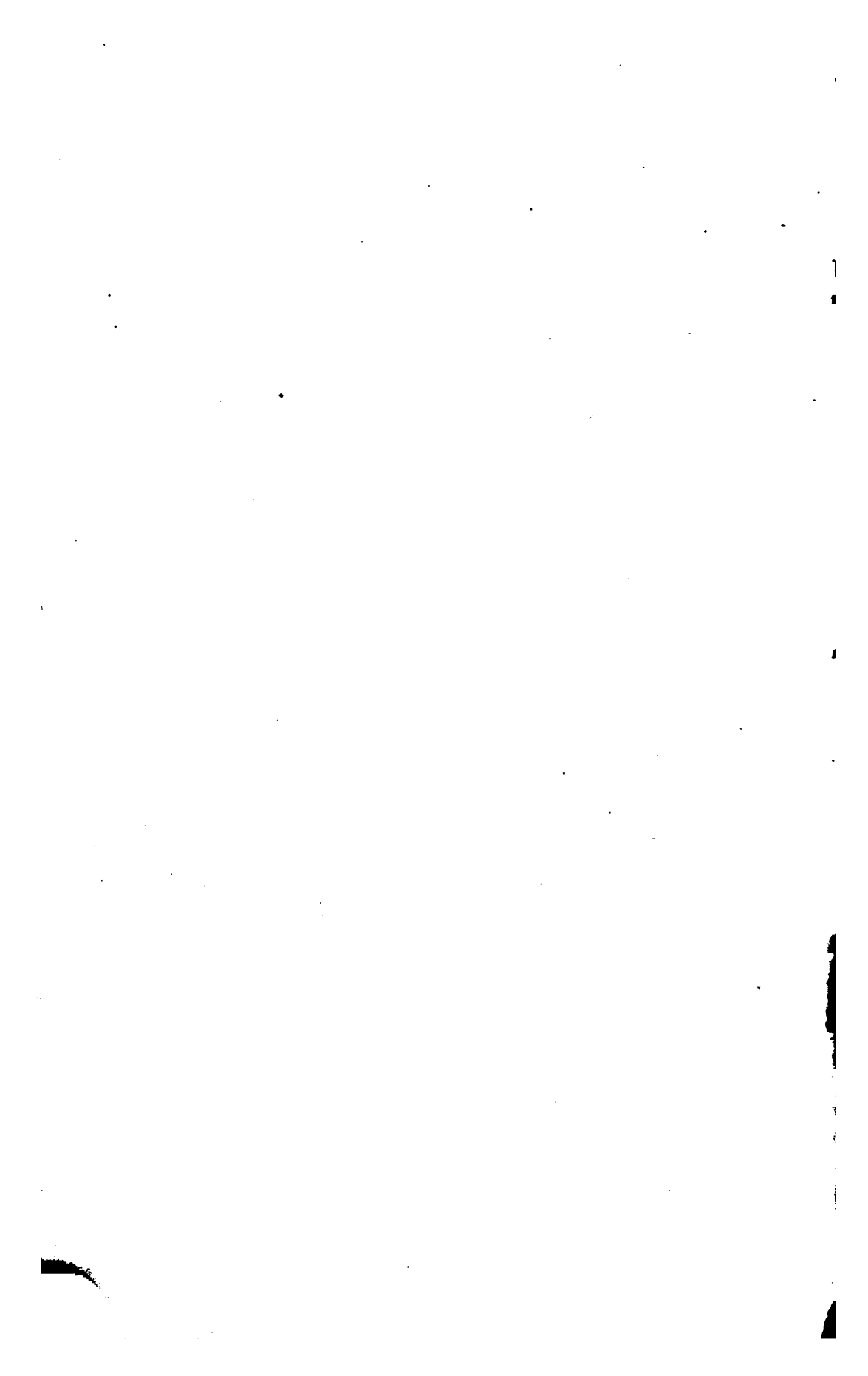
INTRODUCTION
OF
SYSTEMATIC TREATMENT
TO THE
CROWN FORESTS, OF THE CAPE COLONY.

SUMMARY OF RULES
AND
INSTRUCTIONS.

BY
LE COMTE DE VASSELLOT DE RÉGNÉ.

TRANSLATED BY
A. W. HEYWOOD,
FOREST DEPARTMENT.

CAPE TOWN :
W. A. RICHARDS & SONS, PRINTERS, CASTLE-STREET.
1885.



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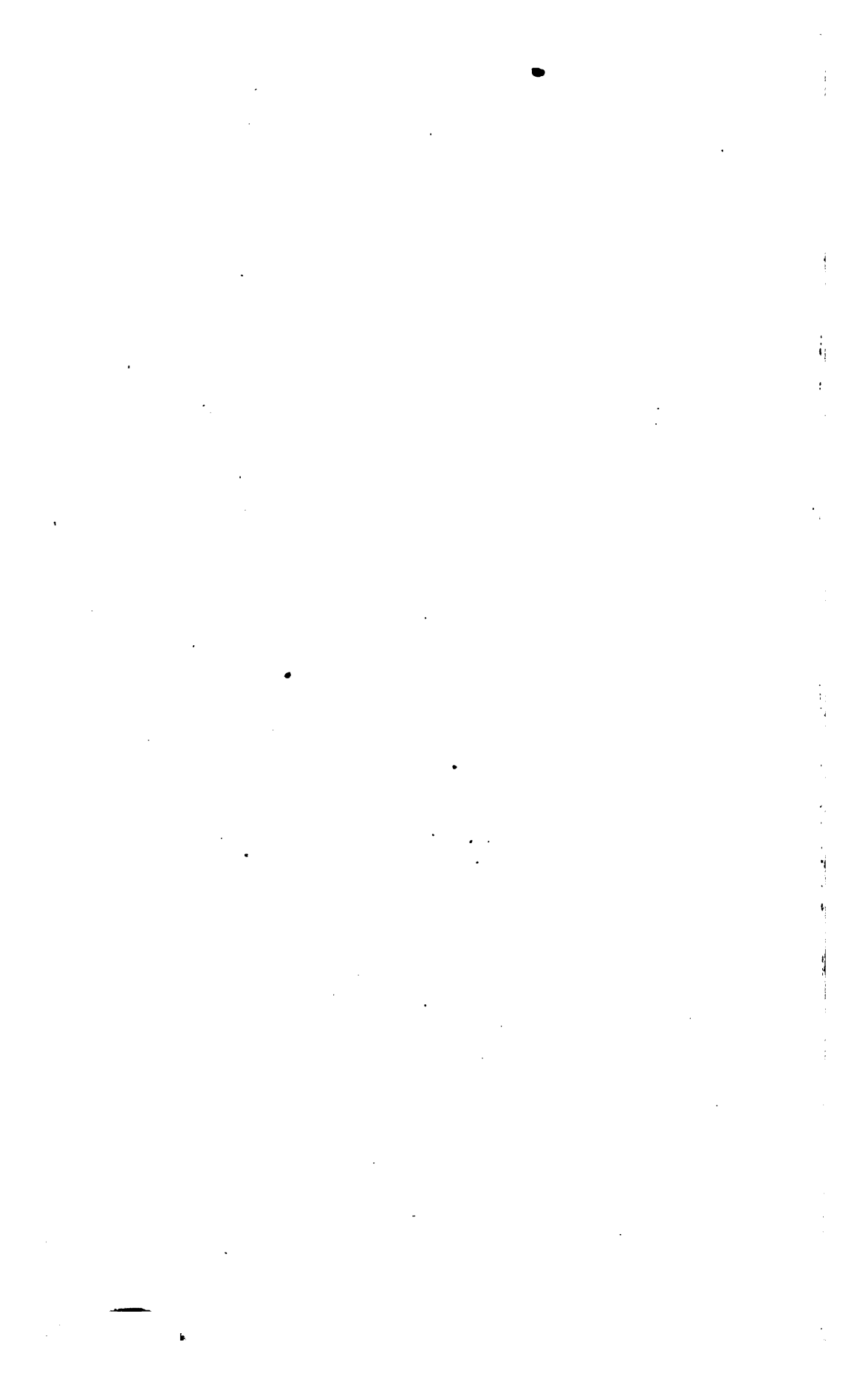
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INTRODUCTION.

This summary treats of Forest operations immediately essential. Each Set of Instructions contains certain explanations of the spirit and motives which have guided its formation, and shews step by step the course to be pursued to gain the desired end.

The Index is sufficient to show the importance of the questions dealt with. This is practically a preface to two works urgently required, and for which I have been engaged in collecting materials during the last four years, viz. :—

A Forest Code, and a Treatise on Forestry, adapted to Colonial circumstances.



INSTRUCTIONS—No. 1.

PRINCIPLES FOR WORKING FORESTS IN ACCORD- ANCE WITH THE REGULATIONS OF 1883.

PART I.—GENERAL OBSERVATIONS.

A.—CONDITIONS OF SYSTEMATIC TREATMENT.

The regulations of 1883 begin with some remarks from a technical point of view, on the general principles of forest treatment :—

“To fell the quantity of timber equal in amount to that which the forest can yield annually in perpetuity, so that each year the quantity may be replaced.

“To assure the reproduction, as quickly as possible, of the best species on the parts cleared.”

There is here enunciated the economic proposition that a Crown forest, in its land and in its wood, constitutes a capital belonging to the community at large—a community which it is essential to consider as being imperishable. This capital should be husbanded, improved, and increased in proportion to its utility, and above all, to the influence which this class of property may exercise on the climate and wealth of a country. This capital is composed of the value of the soil, plus the value of the wood covering it. Trees increase in bulk and form, thus each year a certain number of cubic feet of wood is added. If on any one plot of ground there are too many trees, the growth will be proportionately less. If there are vacant places in the plot the sum of the growths will not be as large as if the whole surface were completely covered by trees. And, lastly, if the plot is wooded with over-mature trees, the sum of the growth will be smaller than where the plot is furnished with trees in full vigour of growth. Thus, for a

given surface there is a certain quantity and arrangement of trees that will give the greatest possible yield, and the capital, in its two-fold sense, of the land and the wood which it carries, should be brought to that point at which the greatest possible yield can be realised.

If from a forest producing each year a certain number of cubic feet of wood, no more is removed per year than a quantity equal to that which has been formed, the capital remains intact. Exactly as on a farm capable, for instance, of only carrying 1,000 head of cattle, and on which 100 head of cattle are raised per year, if not more than 100 head are used during the course of the year the capital may be said to remain intact. If then the capital is complete, *i.e.*, if the land is properly covered with wood, or the forest fully and suitably stocked with trees, the annual yield, like the harvest from cultivated land, may be legitimately credited to the general revenue and expenditure of each year, to be applied for the benefit of the community.

Thus (1st) a forest should be worked so that in any one locality a young and better growth may succeed the old forest which has been cut down.

(2nd.) The quantity of wood cut each year ought to be such that the forest may be maintained at the maximum of production, and, this point reached, no more wood should be cut than is annually produced.

(3rd.) All trees should be utilised and turned to profit, except those required for the conservation, productiveness, and improvement of the forest.

(1.) *Reproduction of the Forest.*

The following conditions require to be fulfilled in the reproduction of a block of mature high forest :—

- 1st. A complete sowing (ensemencement) of the ground.
- 2nd. Protection of the soil from the action of the sun.
- 3rd. Shelter to the young plants for the first few years of their existence.
- 4th. Atmospheric influence allowed to act gradually on the young plants, according to the individual temperament of the species.

These four conditions are ordinarily realised in practice by means of three successive "coupes," or cuttings, following one another over the same ground at short intervals of time.

Seedling Coupe (Coupe d'ensemencement).—The principle of this coupe is to cut enough trees to admit the light required by reserved trees to enable them and to stimulate them, to bear fruit; also to leave sufficient trees standing to supply all parts of the ground with the necessary seeds, and to shelter the young seedlings when they appear.

Secondary Coupe.—As the young re-growth acquires more strength, more light is necessary for its growth. For this purpose a portion of the trees left in the first, or seedling coupe, are felled; by preference, however, trees are taken so that a certain number of trees may be left for the partial shade so beneficial to young plants.

Final Coupe.—When at last it is judged that the young re-growth of seedlings and saplings is strong enough to stand alone, in the final coupe, the remainder of the old trees are cut down. Henceforward, with full light and space, the young trees grow rapidly according to soil and climate. In this manner each compartment of the forest is regenerated successively, and when the last tree of the last compartment has been cut, the rotation is finished; the coupes then begin again with the trees which have had full time to mature in the compartments where the first reproduction cuttings were made.

Thus each compartment is wooded with trees of even age and growth, and the forest presents a series of groups of trees of different ages, the groups being graduated, and maturing one after the other in succession. In this state a forest is called "regular," and such is the mechanism by which, apart from any extreme conditions of vegetation, a *regular* young forest is made to replace mature old trees.

When a forest is left to its natural growth, or to that resulting from the needs of woodcutters, it is, on the contrary, necessarily *irregular*. It therefore presents to view, at every point, trees of various ages mixed indiscriminately, from the young seedling to the old tree, and trees which attain the greatest bulk and height interfere with those

placed immediately under their shade and impede their growth. Thus the latter, not attaining their natural height, stretch out in branches and nearly always become knotted.

When overcrowding is continued, the most feeble trees, stopped in their growth by those which dominate them, contract germs of disease ; they nearly always languish, and many die before arriving at a healthy maturity.

This selection ("*jardinage*") by extending the felling of trees over very large areas, renders supervision difficult, and considerably increases waste in both felling and clearing. The greatest objection, however, consequent upon this method, is that it does not enable the forest to yield, within a given period, any products but those of a nature very inferior, in regard to both quantity and quality, to those obtained by the natural method of propagation by seeds and thinning out. In fact in such forests irregularly worked ("*jardinées*") we see trees of every kind restricted in their development for a time of greater or less duration, and often even to the close of their existence.

In *regular* forests, on the contrary, the growth is encouraged from its commencement, and stimulated up to the period of maturity by periodical fellings undertaken with this very object.

Now it is evident that of two forests that which will supply the most material in a given time, is that in which the generality of trees has the strongest and most sustained growth, other circumstances being equal.

With regard to the quality of the trees, the facility which they have in thoroughly-worked forests ("*jardinées*") to extend their branches renders them inferior for constructive and splitting purposes, to those which had grown in open situations ; and it is to be observed as well that the considerable waste caused by felling and clearing in such a forest multiplies faulty trees, such as are seldom met with in *regular* forest.

To obtain a regular forest, that is, to have trees of each age grouped together plot by plot, in gradation, instead of having them mixed throughout the forest, the custom has been explained of proceeding to the removal of available wood by three successive "*coupes*" at the same spot

(seedling, secondary, and final) at short intervals of time, preparatory to a long period of repose for further development.

In the forests of the Colony, on account of the power of the climate, as regards light and heat, the coupes may be simplified. In fact I have noticed that almost everywhere the forests show a good natural reproduction of plants of the best species. In all the forests that I have visited it will be unnecessary to make separate seedling coupes; the seedling and the secondary coupe may be thrown together. And further, if, when this combined coupe is being made, care is taken to mark for felling only thoroughly mature or over-mature trees, and to reserve for shelter young trees in full growth, selecting those developed from seedlings, and avoiding those developed from coppice shoots, the trees reserved will be of a class that can remain usefully on the ground up to the time of a subsidiary improvement cutting, made with the double object of thinning the young growth, and to clear off the ground all trees which have by that time become mature amongst the reserved trees.

Those of the old reserved trees which remain after the improvement coupe will be left finally for the end of the rotation, and will naturally furnish very fine wood, they being all picked trees left exceptionally long on the ground.

(2.) *Quantity of Wood to be Cut Yearly.*

In order to fix the quantity of wood which may be cut each year in a forest, in order to have the same quantity always available (this quantity being the greatest annual yield, or capability (*possibilité*) of the forest) account must be taken of—

1st. The area of the forest.*

2nd. The material on the ground.†

3rd. The age at which the trees are "exploitable" (workable).‡

Thus, supposing trees of the more valuable species are mature at 80 years of age, that the soil is uniform, and

* See Instructions No. 4.

† Do. Nos. 4 and 9.

‡ Do. No. 5.

wooded with a succession of groups of trees reaching 80 years, one after the other, if each year one-eightieth of the area of the forest is cut over, the cuttings of course being done regularly according to the gradation of ages, then the quantity of wood to be cut each year will remain the same for ever; in other words, the felling will not exceed the capability of the forest.

The above is a simple case, but in every management scheme the three essential points are those enumerated, viz., the area of the forest, the condition of the trees now on the ground, and the age at which they mature.

(3.) *Sale of Forest Produce.*

Payment for wood and all forest produce is made to the exact value of the licences delivered, or on the sale price of the exploitable material on a plot of forest, in cases where sales are possible (Government Notice No. 406, 1883, Sec. 4), according to the conditions of sale in bulk here appended. (See page 85.) Illicit fellings in a forest are deplorable: directly, in the lost value of the wood stolen, indirectly, in the effect on the sale of wood felled in a legitimate manner. Wood from illicit fellings can be sold at a price below that which the legitimate dealer, who has had to pay for his licence, can afford to ask, and who thus loses an outlet for his industry. In forests it is essential that police measures be rigidly enforced, and this cannot, of course, be done without an adequate staff.

B.—OLD METHOD OF WORKING AND ITS CONSEQUENCES.

When a forest was opened, the wood-cutters under the old system searched it through, picking out the best trees for felling. The trees first chosen, because most easily worked, were always those of an average growth, and often hardly mature. The felling and taking out of these trees inevitably caused damage to the surrounding forest. To reach them, spars, poles, and even larger young trees, of no use at the time, but which would in proper course have rapidly reached maturity, were cut and damaged right and left; some because they were

in the path which had to be opened to slip out the trunk of the chosen tree; others, because they stood near soft heavy places of the slip path in which the wood lay, wood-cutters not taking the trouble to fetch from a further distance, those actually cut in the path itself. Others again had to be felled because no precautions were taken in directing the fall of a tree so that no damage should be caused. Scattered and repeated workings in different parts of the forest are especially disastrous. When timber has been felled in any locality, young trees which have not been too much damaged, or too closely covered up with refuse and waste wood, begin to straighten themselves, to recover from their injuries, and to grow into useful trees. But as soon as the best of the mature trees in a forest had all been removed, the wood-cutters went over the ground again looking for trees which at first were thought to be not worth cutting. Then the same process of damaging the young growth and surrounding forest was repeated. Each time, just as the re-growth was recovering from the effects of previous workings, another tree, felled in the neighbourhood, partially destroyed the young wood again. In the end, when the forest was nearly worked out, it was closed, leaving the soil strewn with the remains of the old worked trees, and a young growth often too much damaged to be capable of thorough recovery; above this are old misshapen trees which, with their long horizontal branches, take up more space than would several well-formed younger trees. As a rule no young trees are found there, which can arrive at maturity in 20 or 30 years. All spars, poles, and young trees have disappeared through waste and destruction without any regulations to prevent such action or any officers authorised to oppose it.

It is better, of course, to give the young re-growth this small chance of recovery than by repeated scattered fellings to destroy successively the young growths, until nothing is left and nothing can grow again. The complete closing of the forest stays its utter ruin, but the wood-cutters are thereby deprived of work, and the locality of its supply of wood.

C.—PROBLEM TO BE SOLVED.

The problem to be solved is this :—

1st. To conserve and improve the forests, *i.e.*, to insure both their natural reproduction, and, by having a gradation of ages, a sustained and constant supply.

2nd. To obtain this result by a method which will allow of the utilization of over-mature trees scattered throughout an irregular forest.

3rd. To provide the community with a steady supply of wood, and to ensure a forest revenue; also to give the wood-cutters regular work in the forests. The result of my inquiries on the age at which our most valuable forest species reach maturity, leads me to the conclusion that for the present, and subject to correction as our knowledge extends, we may assume that the age of maturity of the more valuable species lies between 60 and 80 years for certain “*essences*,”* and 120 and 150 years for others. This period of maturity passed, it is probable that over-mature trees may still remain uncut for a considerable period without showing any pronounced signs of decay, or experiencing any notable decline in value, comparing the yearly growth in wood to the yearly interest on the capital value of the trees. I am of opinion that, having regard to the forest condition prevailing at George, Knysna, and Tzitzikama, the principal cuttings can be so managed as to leave on the ground more or less regular masses of young trees, the mean age of which will be between 20 and 40 years of age for some, and 80 and 100 years for others. And these trees will require nothing but complete rest to reach their term of maturity.

In Europe two years are allowed to contractors or purchasers to complete the working out of a coupe; these two years should not be exceeded on account of the danger done to the re-growth as long as the young trees in the coupe are at the mercy of the workmen and their cattle. These two years include also the time necessary to clear away the wood. In all cases the wood must be cut by the purchaser over the entire area in a single season during the first

* “*Essence*” = Species, of forest technology.

year. When a coupe has to remain open for two years for "exploitation" by licence, it would be well to divide it into two parts, one for the first year and one for the second, in order to avoid cutting over the whole area during the first year, and so that there should be no return to the first part in the second year, where young shoots will already have been formed during the summer which will have intervened.

To divide a forest into blocks of between 400 and 1,000 morgen, natural boundaries, such as rivers, valleys, ridges, &c., can generally be utilised; where these are not available block lines are opened.

By sub-dividing each block of forest (or series) into 20 sections or compartments, each of these sections being worked during two years, felling proceeds regularly through the forest in bi-annual sections, or annual subdivisions, so that the mass of trees on any one section will have 40 years' rest, or, in other words, be ready to cut at the end of the rotation of 40 years. The division of the forest into blocks, and the sub-division of the blocks into 20 bi-annual cuttings (Art. 1 of the Regulations), in which the number of young trees left on the ground is equal to the number of mature trees cut, provides a solution of the three closely connected questions enunciated above, since the conservation, the regulation, and the working of the forest within its capability, are all provided for. The object of improvement cuttings is to finish the work which the principal coupe (executed as has been explained separately) has done more or less completely. These improvement cuttings will consist of thinnings, giving the young trees greater space to grow in, and bringing under the axe a certain number of mature trees which could not, without some loss, be left standing until their turn arrived to be cut in the principal coupe at the end of the rotation. Thus the forest will be improved, and at the same time conserved and made regular.

In the second place, account has to be taken of the wants of those who use wood, and of those to whom it affords work and daily bread. From this point of view the forest blocks (or series) must be sufficiently small and numerous that there may be always a section (or compartment) open, and being worked, near localities where wood-cutters have settled.

The number of sections being calculated so that the re-growth in the first section cut, will have grown into mature trees by the time the working of the last section has been finished, it will never at any time be necessary to close the whole forest. In any section which it is proposed to open there are always trees which it is desirable to cut in order to allow the re-growth to develop, and others which it is desirable to leave standing for seed and shelter. It is the duty of the forest officials to select and mark for felling those trees which should be cut. (See Instructions No. 2, page 15.) This done, the section is thrown open, and wood-cutters are free to select among the trees marked for felling any trees they like, and to take out a licence for them. Those trees which will not suit one wood-cutter may answer the purpose of another, and as all work will be concentrated within a limited area, woodmen will utilise trees which they would not have the chance of getting in a forest entirely closed after excessive working.

To pay for a licence and take possession of a tree there must be a basis of payment. For this purpose the forest officials, after marking the trees selected for felling, measure them standing (in circumference and height), number them, and calculate their cubic contents and their value at current rates. Many of these trees contain but little workable timber; for these the price is very low. A wood-cutter who formerly found it difficult to pay £1 10s. for a licence at George or Knysna, or £1 at Tzitzikama, can now get a licence for a few shillings. If an error be made in measuring the value of the cubic contents of the tree standing, Art. 14 of the Regulations provides the means of rectifying it.

The total of the trees marked up to date in the Knysna and George Forests is greater than the mean of previous annual cuttings.

It is essential that the tariff prices of each species should be exactly proportionate to the market rates of the same, and for this purpose they should be periodically reviewed. If the prices of the different species of wood in the forest do not correspond with the prices on the market, the wood-cutters would all endeavour to obtain those species which on working will yield the largest margin of profit, and would

neglect those which yield the least profit. This would reproduce on a small scale within each coupe, the very evils which a faulty management has produced on a large scale in the forests, to remedy which is the object of the Regulations.

PART II.—PRACTICAL DETAILS.

1. There will be a sufficient number of series to provide for one section being always open near each locality where wood-cutters have established themselves.

2. The area of a series will be between 400 and 1,000 morgen; it will rarely exceed the latter figure, nor be less than the former, except in the case of a small isolated piece of forest which cannot be conveniently grouped with another.

3. The first sections of a series opened, should enclose about $\frac{1}{20}$ of the contents (Art. 1, Regulations). If the land is uniformly covered with trees, and equally fertile throughout, $\frac{1}{20}$ of the contents will exactly cover $\frac{1}{20}$ of the area.

If one part—say half, for example—is without trees or exhausted, $\frac{1}{20}$ of the contents, cut down in the best place, would only cover half $\frac{1}{20}$, or $\frac{1}{40}$ of the total area, and the section should not be extended beyond that proportion.

If a series, A, contains both North and South aspects, the sections (n) facing the North should generally have an area of $\frac{1}{10}$, ($\frac{n}{10}$), *more* than $\frac{1}{20}$ of the total area $\frac{A}{20}$, and should be $\frac{A}{20} + \frac{1}{10} (\frac{A}{20})$; and those facing the South, $\frac{1}{10}$, ($\frac{n}{10}$), *less* than $\frac{1}{20}$ of the total area $\frac{A}{20}$, and should be $\frac{A}{20} - \frac{1}{10} (\frac{A}{20})$. So that by adopting this plan, sections with a South aspect will be $\frac{2}{10}$ smaller than those with a North aspect, unless there are other reasons to the contrary.

In a word, areas of sections should vary according to the distribution of the trees, character of the soil, aspect, or any circumstances which influence their productiveness.

4. As a rule, the first section in a series will be opened in that portion of the series best able to meet the wants of the wood-cutters of the locality. As the first sections should be opened in the parts containing the greatest

quantity of wood, they will frequently cover *less* than $\frac{1}{20}$ of the area; perhaps $\frac{1}{25}$, or $\frac{1}{30}$, or even $\frac{1}{40}$ of the total area of the series, according to the general condition of the stock, in order that their contents may not exceed $\frac{1}{20}$ of the total contents. The sections will be ranged in regular order, beginning with the section first opened.

5. No tree, without special reason, is to be marked for felling within 30 yards of the edge of the forest, or within 20 yards on either side of a ridge top, stream, spring, or road within the forest; nor are trees of middle age to be so marked.

6. The selection and marking of trees to be felled should be done with the greatest care, and in order that no trees may be overlooked, the work should be done in narrow bands, called "virées" in forest language; (see Instructions No. 2).

7. The young re-growth of forest species should be examined, and the better the re-growth the greater will be the number of old trees marked for felling. As far as it can be done without injuring the development of the re-growth, all well-grown trees from 20 to 50 years of age should be reserved, and the remaining trees marked for felling.

8. No poles standing alone, nor any seedling or sapling of a timber tree, should be marked for felling.

In a group of poles, most of them may be marked for felling, except the thickest and straightest. The poles so left uncut are not to be more than three yards apart.

9. When a tree has been marked for felling, those trees near it should also be marked for felling which appear likely to be injured by the fall of the large tree.

10. Particular attention is always to be paid to stink-wood, in accordance with special instructions given about this species.

11. The poles referred to in the Regulations should be obtained from saplings which are over-crowded, or dominated, or which from some other cause cannot be expected to develop into useful trees. These poles are such as can be used for disselbooms, long-wagons, &c. Smaller poles, only suitable for fencing, &c., are termed spars, and are charged at lower rates in the Regulations.

12. In measuring trees the diameter will be taken with a "diameter-gauge," graduated from 2 inches to 2 inches.

The height of the trees is estimated by eye. The total height of the clean stem or bole of the tree is entered first, and then the total height of serviceable stem; the estimate is made so as to be always below, rather than above, the true height.

13. In calculating the cubic contents of a standing tree, the taper of the trunk will be allowed for according to the average taper of trees of its species in the same forest. The average taper for any species will be found by felling a certain number of trees in each forest, and measuring the average decrease in girth per ten feet of length.

14. The cubic content of the squared log is taken at 60 per cent. of the round log, calculated as above.

15. On the demand of the licence-holder, and from time to time, in order to verify measurements, a second measurement, prescribed by Art. 14, Government Regulations, will be taken by the Ranger, and noted in a book kept for the purpose.

Particulars of this measurement will be endorsed on the back of the licence in any case in which the licence-holder can show that he is a loser by the original measurement. If, on the other hand, he is a gainer, no notice will ordinarily be taken of the difference; but in case the difference may be large, the matter will be referred to the Conservator, who, should it appear necessary to do so, in order to avoid injustice to other licence-holders, will issue orders for the recovery of the excess value.

The second measurement prescribed by Art. 14 will only include sound wood. Where there is any doubt as to the soundness of a piece of timber, its measurement will be deferred till it has been cut up. But in any case the old tree, sound or unsound, is the exclusive property of the licence-holder who bought the licence for felling it.

16. When issuing licences, the Conservator or officer in charge will point out that in order to be relieved of the liabilities stated in Article 13, Government Regulations, the holder of the licence must observe the following rules:—

In cases where it is absolutely necessary to cut down trees not included in his licence, in order to reach those for which he holds a licence, the wood-cutter must point this out to the officer in charge of the section when he presents the licence, and request him to mark those trees it is necessary to cut down, which are of any use for poles, spars, &c. The officer in charge will either do so at once, or give precise instructions regarding the wood which may be felled, pending his future inspection.

This the wood-cutter must remove close to the ground and lay serviceable pieces in piles along the side of the path at places indicated, and he must in every particular follow the directions of the officer in charge. (See Art. 17.)

Trees or branches damaged by the fall of those licensed to be cut, unless through carelessness, must be properly pruned and trimmed, if they can still be preserved; but if the officer in charge is of opinion that they cannot thrive, they must be dealt with in the manner mentioned above.

17. The officer in charge, after registering each licence, must mark every tree granted, and must take an exact note of all wood which he has found, it was, without doubt, impossible to avoid cutting down. When the use of poles is absolutely necessary to render the slip-paths available, he should only authorise the use of those already cut down, which have no saleable value, either on account of deformity or species, especially reserving those suitable for wagon work (disselbooms, long-wagons, &c.)

At the end of every week the officer in charge should send the Conservator a statement of wood so cut down, showing how much has been used for the slip-paths, and how much is available for the Conservator to include in future licences.

18. The trees must be cut as close to the ground as possible, and in no case must the stump left on the ground after felling, be more than six inches in height from highest point of the ground to the highest part of the stump.

This height might be increased to a foot for large trees of species which do not shoot from stumps.

In cases where a tree has more than one stem, the dis-

tance (six inches) is to be measured from the point of divergence.

19. Immediately after the expiration of the time for working a coupe, the Inspector, or Ranger, in charge of a sub-conservancy, assisted by the officer under whose immediate supervision the coupe is, should point out amongst the trees marked for felling, but still standing, those which should be felled in the interest of the forest, and those which can wait for the next exploitation.

From this inspection a statement must be drawn up, showing clearly—

- (a) What has been done.
- (b) The present condition.
- (c) What should be done to put the coupe in proper order for the best re-development of the trees.
- (d) An estimate of the probable cost of the necessary work, stating whether the value of over-mature and decaying wood, which should be removed to put the forest in the best condition for producing wood of good quality, would cover the expenses of the work required.

This report should be transmitted by the Conservator to the Superintendent, with his opinions and suggestions.

INSTRUCTIONS—No. 2.

METHOD OF MARKING TREES IN A "COUPE."

Preliminary.—Trees for felling should be distinguished and marked before being cut down: on this point opinion is unanimous, almost intuitively.

But when persons entrusted with the selection and marking of trees for felling, have nothing to guide them but their instinctive ideas, it follows they would naturally be lead to mark the trees the wood-cutters themselves would have chosen, not wishing to act by caprice or partiality, which would be worse still. In this latter case,

their work would be entirely useless, their expenses thrown away, and they would become unconsciously responsible for the ruin of the forests.

If we look at the end in view, and consider the reasons for this preliminary marking, we discover the conditions which must be observed, and recognise the necessity of systematic procedure to attain profitable results.

In a forest regularly exploited, the "coupes" annually succeed each other, over fixed areas, so that a rotation is formed which makes their succession perpetual.

In a "Coupe" (that is an area intended for felling) there should be marked for cutting:—

- a. All matured trees *not required for the conservation or amelioration* of the forest,* which are useful for industrial purposes and profitable to revenue, and those which, without being useless, can be taken away at no inconvenience in order to facilitate the removal of profitable trees.
- b. All trees of no value in themselves but which hinder those of value from growing in their place or proximity.
- c. All superfluous trees: those which though not mature, are unnecessary on a certain spot.

Thus, trees which are to be felled should first be marked and once marked are available for anyone who wishes to purchase them. This must be done in such a manner that there may be no possibility of confusion. Each tree must be measured so that on referring to the book of contents, and calculating at the legal tariff price, it can be at once seen what amount must be paid for permission to fell it.

According to Article 3 of the Regulations of 1883, trees

* Mature, sound and valuable trees must be reserved at all places where there are no others which bear seed to stock the ground with young plants, or to give shade necessary for their growth, especially at places exposed to the scorching rays of the sun.

As a rule wood should not be cut within 20 yards of a stream, spring, ridge, road or the edge of the forest, nor timber trees under three feet in girth at 4 feet from the ground.

Likewise no poles standing alone, nor any sapling or seedling of a timber tree, ought to be cut. In a group of poles all may be cut except the thickest and straightest.

The poles so left uncut are to be not more than three yards apart. •

to be felled in each section are previously marked, measured and numbered.

The sections are of considerable extent, often occupying an area of 40 morgen or more, sometimes covered with a thick undergrowth of bushes, crossed by deep kloofs, and always difficult to examine thoroughly.

On the other hand, the manner in which the trees for felling are selected, will have a very decided influence on the future of the forest.

The officer superintending must take into account the form of such tree; its state of growth; its distance from neighbouring reserved trees; its influence on the young re-growth around, as regards both shade and "covert" (direct overshadowing); its value as a seed-bearer. It is thus necessary to proceed with the utmost care and order, as otherwise it would be better to leave to the wood-cutters the free choice of trees as formerly, rather than assume the responsibility of "exploitations," quite as injurious, if made without any more knowledge or care.

The following is the manner in which the work should be performed:—

Instructions.

1. At right angles to the general slope of the ground, that is to say, almost level, parallel lines called "ordons," just wide enough to allow a man to pass easily, are opened. These "ordons" are at an average distance of 30 yards; the space included between two "ordons" is called a "virée."

2. The section is first inspected and the type of cutting to be adopted is determined, (seedling, secondary or final coupe).

3. When about to commence marking, the nature and the object of the work to be done, particulars of the trees to be marked and of the spaces between those to be reserved, are explained to the men.

These men are for three purposes: the first are provided with hammers, and are called "hammer-guards," the second carrying forest compasses, or diameter-gauges, are the "gauge-guards," the last carry materials for numbering the trees.

If necessary the same man may carry a hammer and a gauge.

4. The gangs are drawn up in line and numbered. In the first rank the hammer guards are placed, each being followed by a gauge-guard, and a man with marking materials; this group of three men is never to be separated.

The officer stands in the "ordon" which separates the "virées." At the extremities of the line formed by the gang, the two most skilled men are posted. The hammer-man, No. 1 group, is placed the farthest from the officer, on the other side of the "virée," and is called the "guide;" the other next to the ordon in which the officer stands, and is the last number of the gang.

5. The groups must advance together, preseving a front slightly oblique to the line of march. The guide is somewhat in front, and selects the trees to be marked on his route. The hammer-man of No. 2 group regulates his progress with that of No. 1. He takes into consideration the spacing of the trees stamped by the guide, and is influenced in his selection accordingly. The hammer-guard of No. 3 is similarly influenced himself by No. 2, and so forth, if there are other gangs. To inspect all the trees the zigzags of each group right and left on the line of march, must extend to half the distance which separates two groups.

6. The hammer-guards should always place the mark at the foot of the tree to be felled, facing that portion of the coupe not yet marked. The tree should then be blazed at the height of a man's shoulder on the side which the officer can see, and on that place the number painted.

7. The gauge-guard applies his instrument to the tree, holding it level so that its arms embrace the trunk; he also turns it round a little to be sure that he measures the mean diameter. He then turns to the officer and shouts distinctly the number of the tree, the species, the diameter as shewn by the last number uncovered by the sliding arm of the gauge, the total height of the trunk, and the serviceable length.

8. Small dwarfish or sickly trees not likely to grow, or

which for other reasons should be cut down, but only fit for poles or spars, are stamped in the same way as the other trees to be felled. The poles are marked with as many horizontal lines as there are seven feet lengths in the tree, and the spars with as many vertical lines as there are 20 feet lengths. They are registered by shouting only the word "pole," or "spar," and the number of them contained in a single tree.

9. The officer repeats the measurements in a loud voice and enters them in a pocket-book. At the same time he watches the work and gives the men necessary cautions and instructions. As a rule he works in the ordons opened on the side on which the trees are marked, but should leave it to examine anything which merits special inspection; he then returns to his ordon which limits the virée in which the men are marking the trees.

10. At the end of each virée, the officer closes the list, writes down his remarks, and asks the men if they have any suggestions, and if necessary, he gives further instructions.

11. When passing into the next virée, the men are wheeled round into the reverse order, so that the man having the last number in the preceding virée, becomes the guide of the virée about to be marked.

In this way the same man passes to the edge of the virée next to the trees he has pointed out in the last virée, as he can best recollect them and judge their distance to the trees he has now to mark. The former guide becomes the last hammer-guard of that group of the gang, having the last number, and the officer follows the ordon which separates this virée from the remainder of the coupe to be marked. All the stamps are to be applied on the side of the trees facing the remainder of the section and the officer in his ordon.

12. At periodical intervals it is well, in order to keep the men active, to give the hammers to the men who were measuring and the gauges to the men who were stamping.

13. So soon as a coupe is marked, the officer in immediate charge should calculate the contents of the trees so marked, in accordance with the diameters and lengths of

sound wood recorded in the "Hand-book," and by means of the tables adapted to the decrease of each species in the forest under consideration. These decreases will be pointed out by the superior whilst superintending the marking of the coupe.

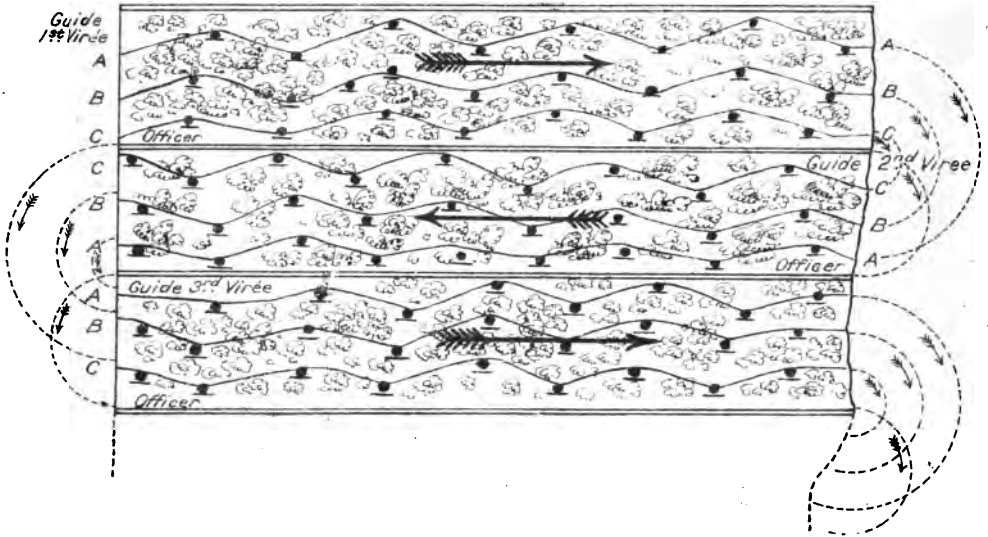
Serviceable wood should be calculated at 60 per cent. of the round (tapering) volume.

Results thus obtained should be tabulated in the Register form G. 2, annexed hereto, and a blank line left between each. The totals should be stated at the foot of each page, and carried forward to the next. At the end of the register of the contents of each virée, a partial recapitulation of species and values should be made, and a general recapitulation of all virées should follow the entire registration.

14. Calculations should be verified and attested by the official managing the coupe, who should then submit to the Conservator the note-books and registers pertaining to the coupe, together with a certified copy of the recapitulation tables for transmission to the Head of the Forest Department.

The annexed sketch shows the procedure of the work :—

Marking Three First Virees of Coupe No. 1.



Forest Series

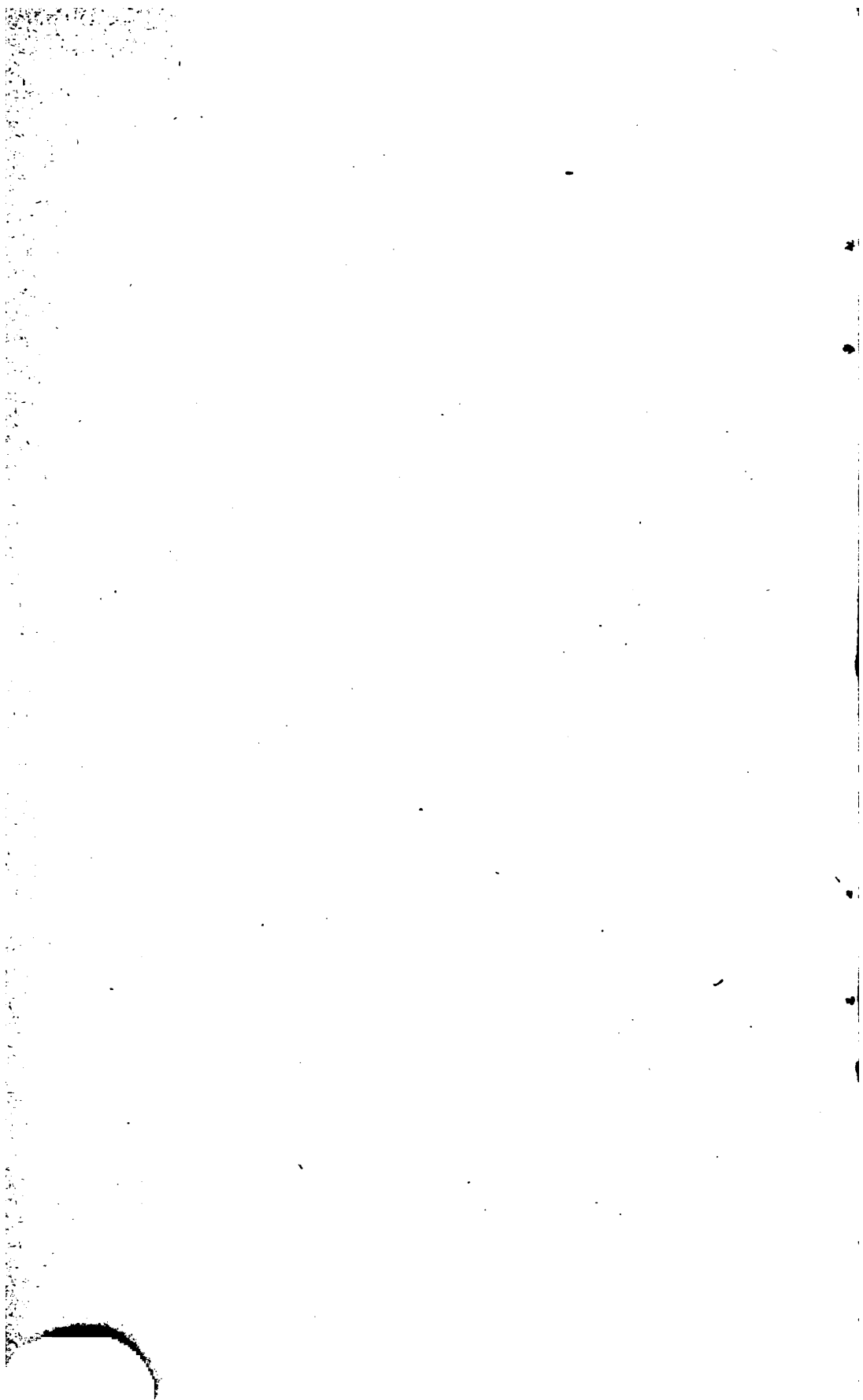
Nº 20	Nº 10
Nº 19	Nº 9
Nº 18	Nº 8
Nº 17	Nº 7
Nº 16 Forest	Nº 6
Nº 15	Nº 5
Nº 14	Nº 4
Nº 13	Nº 3
Nº 12	Nº 2
Nº 11	Coupe to be marked
	Nº 1

[G. 2.]

DEPARTMENT OF WOODS AND FORESTS.

REGISTER OF STAMPED TREES.

Conservation _____*Division of* _____*Forest of* _____*Series* _____*Section* _____



INSTRUCTIONS—No. 3.**SUPERVISION OF SECTIONS.**

1. During the wood-cutting season Forest officers in immediate charge of sections are requested to spend as much time in the open sections every day, as is necessary to afford the wood-cutters all the assistance they require, and to superintend the cutting of the wood. As a rule they should always remain in the open sections, unless engaged on duty elsewhere.

2. Wood-cutters requiring trees should go to the officer in charge (Ranger or Guard) and request him to go into the forest to assist them in finding trees of the kind and size they require.

3. Having arrived with the officer in the open section, the wood-cutters point out to the officer the trees suitable for their purpose.

4. The officer in charge should write down successively, for every tree required :—1st. The number of the Virée ; 2nd. The number of the tree (himself helping, if necessary, to distinguish numbers which may be slightly rubbed out, by reading numbers on neighbouring trees which may be more distinct*); 3rd. The species.

5. The list so made out should contain more trees than the wood-cutter really wants, so that it may not be necessary for him to return to the forest if he should find at the Conservator's office that the trees he most prefers have already been allotted to others.

6. With this list the wood-cutter should go to the officer in charge of the section, and hand in his licence to be registered and endorsed. In conformity with Article 12 of Government Regulations, he will then be at liberty to cut the wood specified in his licence.

* If he cannot quite read the numbers he must write down what they appear to be, and replace by crosses those which are quite illegible (2 x 6) : and besides that, to complete the identification, he must note down the diameter and approximate height of the tree.

8. To be relieved of the liabilities of Article 13, Government Regulations, the holder of the licence must observe the following rules, as prescribed by Instructions No. 1, Article 16, and following :—

a. In cases where it is absolutely necessary to cut down trees not included in his licence in order to reach those for which he holds a licence, on presenting his licence the wood-cutter must point them out to the officer in charge of the section, and request him to mark those trees it is necessary to cut down, which are of any use for poles, spars, &c. The Ranger should go and see this marking done before wood-cutters fell their licensed trees, but if unable to go before the trees are cut down, he should instruct the wood-cutters :—

1st. To cut only those trees not included in his licence which it is impossible not to damage in cutting down those for which he has taken out a licence.

2nd. Not to cut in pieces any unserviceable lengths, and to keep entire all serviceable lengths, which can be used and granted under fresh licences, and the Ranger must inspect them as soon afterwards as possible.

These the wood-cutter must remove near to the ground, and lay in piles along the sides of the path at places indicated, and he must in every particular follow the directions of the officer in charge.

b. Trees or branches damaged by the fall of those licensed to be cut, unless through carelessness, must be properly pruned and trimmed, if they can still be preserved, but if the officer in charge is of opinion that they cannot thrive, they must be dealt with in the manner mentioned above.

9. The officer in charge after registering each licence, must mark every tree granted, and must take an exact note of all wood he has found, without doubt, it was impossible to avoid cutting down.

When the use of poles is absolutely necessary to render the slip-paths available, he should only authorise the use of those already cut down which have no saleable value, either on account of deformity or species, especially reserving those suitable for wagon-wood, engraving, &c.

At the end of every week the officer in charge should send the Conservator a statement of wood so cut down, showing how much has been used for the slip-paths, and how much is available for the Conservator to include in future licences.

10. The trees should be cut as close to the ground as possible, and in no case must the stump left on the ground after felling a tree be more than six inches in height, from the highest point of the ground to the highest part of the stump.* In cases where a tree has more than one stem the distance (six inches) is to be measured from the point of divergence.

11. On the demand of the licence-holder, and from time to time in order to verify measurements, second measurements prescribed by Article 14, Government Regulations, should be taken by the Ranger and noted in a book kept for that purpose; particulars of this measurement must be endorsed on the back of the licence in any case where the licence-holder can shew he is a loser by the original measurement. If on the other hand, he is a gainer, no notice will be given to him, but the difference will be referred to the Conservator, who, should it appear necessary to do so, will issue orders to recover the excess value, according to Article 14 of Government Regulations.

This measurement of verification only includes sound wood. Where there is any doubt as to the soundness of a piece of timber, its measurement should be deferred until it is cut up. But in any case, the whole tree, sound or unsound, is the property of the licence-holder, who bought the licence for felling it.

12. At the request of the wood-cutters the officer in charge must point out places for saw-pits, and depôts for

* This recommendation is specially applicable to young trees, and to those species which shoot from the stump, to form timber, as Stinkwood, but this height may be increased to a foot for large trees of species which do not shoot from the stump.

timber. Trees standing on these spots should be dealt with as explained in Article 8 of these Instructions.

The officer should furnish a weekly statement to the Conservator of the places so utilised.

INSTRUCTIONS—No. 4.

INVENTORY OF STANDING FOREST STOCK.

Preliminary.—In order to determine the quantity of wood which may be annually felled in a forest, so that it may not become exhausted, but that its yield may be raised to its maximum production, we must know the area of the forest, and of what its stock of trees consists; such statistics are invaluable when enquiries are made as to the quantity of wood available for special purposes, as, for instance, sleepers, engraving, fishing rods, weavers' shuttles, &c.

To make a perfectly exact inventory it would be necessary to procure a return of all trees existing in the forest. Such an operation would be practically impossible in many places, especially in the Colony, and is not necessary. It suffices generally to divide a forest into plots, as homogeneous as possible as regards soil, situation, and "peuplement,"* and an exact plan is made of these divisions. The plots are selected which should be first regenerated† in a certain number of years, called a period. The poles, spars, and trees of each species are counted, the diameter and height of each tree measured, and an exact return is made of the contents of these plots only. The others are taken at an average obtained from sample representative areas carefully selected. This method takes much more labour than can be devoted to it, when destruction has to be stopped suddenly, without at the same time entirely suspending the felling of timber. In the event of an approximate return being required quickly and inexpensively, a more summary valuation suffices.

* "Peuplement."—Number, species, and distribution of all vegetable productions.

† "Regenerate."—To remove old trees and replace them by young re-growth.

Instructions.

1. To make a summary and rapid valuation of the quantity of wood available* in a forest, the following method should be adopted :—

- a. Divide the area, imaginatively, into groups similarly wooded, stating the percentage each group forms of the whole forest.
- b. In each similar class of forest land select a space representative of the whole, about 2 square chains in extent (say 2 chains long and 1 chain wide).
- c. Measure and describe the trees in this area.
- d. Multiply the result thus given for each sample area by the number of times it is contained in the whole class, and add the totals together.

2. To determine the comparative groups in a sample area a rapid glance must first be taken of the noticeable differences in the constitution of the forest.†

3. If there are two or three distinct varieties of soil, for instance clay, granite, sand, or lime, it is probable that the trees will vary under the different circumstances, and they should not be included in the same group.

4. The nature of the soil of each group should be characterised as explained on page 37 (Instructions on the investigation of growth, sections 9 to 15).

5. As regards aspect, altitude, and declivity, in many forests of the Colony groups of trees similarly constituted, may be sufficiently delimited by the following topographical features :—

Flats, from 0 to 4 °/°.

Sloping ground, 4 to 15 °/°.

High ground, north aspect.

* Available with a view of disposing of a quantity of timber equal in amount to that which the forest can yield yearly in perpetuity, so that each year the quantity felled may be replaced ; and to assure the reproduction as quickly as possible of the best species on the parts cleared. (Regulations No. 406, 1883.)

† A topographical plan of a forest containing water-courses, kloofs, valleys, ridges, and flats, is necessary for this purpose. If it does not exist the officer is put to the trouble of making a rough sketch of these natural features from such a place as he can see the greatest part of the forest.

7. Suppose, for example, this plan were adopted in a forest, estimated at 3,000 morgen, and that plateaux form only a kind of fringe above the slopes which may be 7 or 8 times more extensive than the plateaux; that the valleys and bottoms are only strips scarcely larger than the plateaux themselves, and also that the southern aspects are decidedly in excess of the northern; say that:—

Plateaux occupy	...	...	0.1
South aspect	...	...	0.5
North „	...	...	0.3
Vleis and Bottoms	...	...	0.1
			<hr/>
			1.0

8. In a place representing the average quantity of wood on the plateau, measure a surface of 2 chains long and 1 chain broad. On this area measure both the old and young trees, and tabulate the result according to the form A annexed.

The same plan must be followed regarding southern and northern aspects, valleys, and bottoms.

9. This work being finished, a summary must be made of the results according to form B, annexed, and a recapitulation according to form C.

10. If the totals appear at variance with the general appearance of the forest, or the sample area appears to give a somewhat incorrect idea of the average quantity of certain species contained in the forest, the fact should be noted, and the supposed difference stated below the calculated figures, with reasons and remarks (see for instance form C).

(It must be fully understood that the figures stated are entirely suppositions, and simply given *pro forma*, to be replaced by a convenient distribution and by statistics gathered on the sample areas.)

Remarks.—It is for the Conservator as the Chief Forest Officer of his division to consider the special conditions to be regarded in each case, and to see that the officers under him supply the information required correctly.

It was necessary in 1884 to ascertain the quantity of wood suitable for fishing-rods and for engraving purposes (especially boxwood) available in the forest of East London.

The Conservator of King William's Town, on receiving general instructions, rightly considered it his duty to adapt them to the local circumstances of his Conservancy. In this spirit he has adopted a plan of procedure in the order in which nature has caused the different classes of trees to grow in the forest.

This method, though requiring a much larger amount of labour, as it covers large areas, should give a reliable approximation. It may perhaps be followed with advantage when officers have sufficient time at their disposal.

The following is the proposed plan, taking boxwood as an example :—

“ Make a sketch map of all the forests where box occurs ; colour these maps in three tints of green, the three tints showing—

1st. Forest where box is abundant.

2nd. Forest where box is in average quantity.

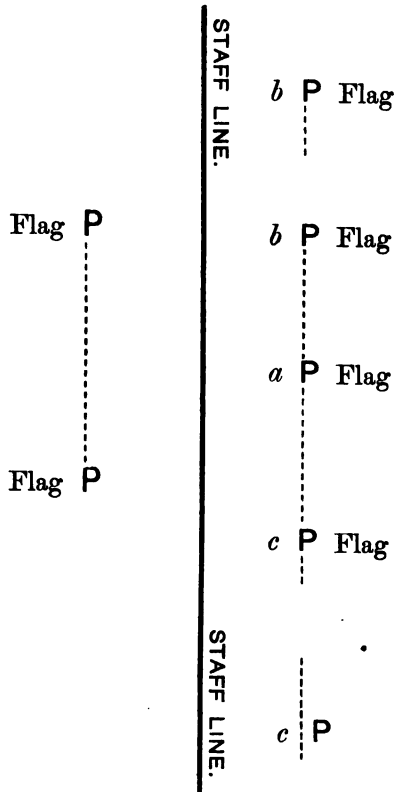
3rd. Forest where box is scarce.

Through each of these classes of forest sample areas should be taken in the form of a band running right across a portion of forest representative of each of the three classes of forest. In the sample areas the girth, height, (height of trunk and height of tree) and species of every tree is to be taken and entered in a register.

To lay out a sample area on the ground, select a piece of forest from 200 acres to a square mile in area, one in which you would consider the box is either “ abundant,” “ in average quantity,” or “ scarce,” and distributed fairly evenly throughout. Take a bearing with a compass on the centre of the block of selected forest, and lay out a staff line through the centre of the block of forest. Then measure the length of this staff with a chain. I will send you a Gunter's chain for the purpose if you have not got one.

The line laid out and measured, it remains to enumerate the trees on both sides of the line which fall within a

distance of 11 yards, or $\frac{1}{2}$ a chain of the line. For this purpose measure 11 yards on both sides of the line at right angles to the staff line at frequent intervals, and stick in flag thus :—



The several flags on each side of the staff line will come naturally nearly in line, but when the undergrowth is thick, it will suffice to see two flags on each side of any other flag. Thus, for instance, in the diagram it will suffice if from (*a*) you can see the flags before and the flags behind at (*b*) and at (*c*). Thus the thicker the undergrowth the more numerous must be the flags. The staff line should be just sufficiently wide enough to walk and chain along. To cut it, the Forest Guard Mather and a paid assistant may be employed. I should perhaps explain

that a staff line is made by putting in a number of sticks about 6 feet high with a piece of white paper on a slit at the top. From any one stick or staff, two others must always be visible in each direction. In traversing rises and hollows the staffs require to be more numerous than on level ground. On level ground the farther apart the staffs are placed the better, provided that standing at one staff two staffs can always be seen in each direction. Thus taking a width of $\frac{1}{2}$ a chain on each side of the line, your sample area will be a chain broad, and every ten chains taken along the staff line will represent one acre in area. In chaining it should be noted when the sample area passes from comparatively steep to level ground, and *vice versa*; also observations regarding the aspect, slope, and nature of soil of the sample area should be taken."

I have, &c.,

(Signed) D. E. HUTCHINS.

The forms referred to on page 29 now follow:—

[A.]

1ST SAMPLE AREA (PLATEAU).

Length, 80 yards; width, 20 yards. Area, 100 sq. rods, or $\frac{1}{8}$ morgen.

Trees matured or decaying; to be cut.	Trees growing; to be reserved.
(1) <i>Box Wood</i> , 18 × 30—12 × 24. 2 (14 × 15).	(2) 4 (3 × 18)—4 × 90—9 × 30— 10 Sticks, &c. Many young plants.
<i>Sneezewood</i> , 12 × 20—15 × 25.	3 (4 × 20)—12 × 30—2, and 4 to 5 young plants.
<i>Saffron</i> .	
<i>Bourbon Tree</i> .	
<i>Myrtle</i> .	
<i>White Pear</i> .	
<i>Iron Wood</i> .	
<i>Milk Wood</i> .	
Remarks:	

(1.) The first figure should represent the diameter in inches measured by the simple use of a two foot rule applied at 4 feet from the ground; the second figure represents the serviceable length.

(2.) The first figure indicates the number of trees of the dimensions which follow in parenthesis.

[B.]

Return of matured Trees according to experimental Results.

Sample Areas.	Number of Trees.				Volume.	
	Species.	For each sample area.	Per Morgen.	Total in area of similar character.	Average content per one Tree.	Content in area of similar character.
No. I.—Plateau (1/10) 1/10 3,000 morg. = 300m. Sample area = $\frac{1}{8}$ morgen.	Box Wood ..	4	24	7,200	10 c. ft.	72,000 c. ft.
	Sneeze Wood	2	12	3,600	12	43,200
	Yellow Wood	1	6	ETC.	ETC.	ETC.
	Saffran	4	24			
	Bourbon Tree	4	24			
	Myrtle	1	6			
	Witte Pear ..	2	12			
	Iron Wood ..	3	18			
	Milk Wood ..	1	6			
			132			
No. II.—S. Aspect.	Box Wood ..					
	Sneeze Wood					
	Yellow Wood					
	Saffran					

[C.]

RECAPITULATION.—Forest of ———. 3,000 morgen.—Trees available for felling.

Character of Forest.	Extent.	Box Wood.		Sneeze Wood		Yellow Wood		Saffron.		Bourbon Tree		Myrtle.			
		Number.	Cub. cont.	Number.	Cub. cont.	Number.	Cub. cont.	Number.	Cub. cont.	Number.	Cub. cont.	Number.	Cub. cont.	Number.	Cub. cont.
	morg.		c. ft.												
Plateaux ..	300	7,200	72,000	3,600	43,200	Etc.									
South Slope ..	1,500	90,000	1,080,000	60,000	750,000										
North Slope ..	900	18,000	180,000	9,000	78,000										
Bottom and Vley	300	12,000	180,000	11,400	128,800										
Total ..	3,000	127,200	1,512,000	84,000	1,000,000										
Figures corrected according to general information	3,000	..	..	80,000 *	800,000										
Annual yield 1/40			27,800	2,000	20,000										

Remarks.

* The sample area shews a rather large proportion of Sneeze Wood as the supplies of this Wood have taken been from other places.

INSTRUCTIONS—No. 5.

INVESTIGATIONS ON THE GROWTH OF TREES IN FORESTS AND PLANTATIONS.

Preliminary.—It is necessary to make inquiry into the rate of growth of trees in order to ascertain the time which must elapse for a plant to become successively a pole, a middle-aged tree, a mature tree, and finally a declining tree; to ascertain the area of ground it requires at each of these stages; and to procure data on the form, volume and corresponding qualities at the different periods of development.

Without this knowledge it is not possible to judiciously mark trees for felling, or to reserve those required for the conservation of the forest. Neither would it be possible to judge when the mature trees of the same plot should again be worked, as these data can alone determine the quantity of wood which may be annually cut in the forest, and at the same time preserve and improve it, so that gradually it may be brought to its highest point of productivity.

To ascertain the rate of growth, two methods of investigation are employed. The first is the periodic and continuous observation of standing trees, the other the careful examination of the structure of felled trees.

The observation of growing trees is made by noting every season, the increase in girth of individuals of different ages growing in various localities.

The examination of felled trees determines the shape, thickness, and composition of the layers; the proportion of heartwood, sapwood and bark; the shape of trees; their actual contents; their serviceable contents; the area of ground they cover. Taken in conjunction with the statistics collected concerning growing trees, this information supplies the means for determining the influence of the soil, climatic surroundings, the cause of certain growths; and together they reveal to us the laws followed, and enable us to ascertain the time required, by nature to bring wood to

different degrees of perfection; and to determine the age and ordinary development of trees found under varying conditions.

For useful reference the statistics thus collected should be carefully and methodically registered.

OBSERVATION OF STANDING TREES.

1. The register of the growth of certain standing trees is made for the purpose of collecting statistics on the increment of trees found growing in the forest under different conditions of soil, aspect, climate, and grouping.

2. Each sheet of the register corresponds to a tree, and contains the following information regarding it: Number, species, and origin (seedling or coppice).

When possible it is well to make a simultaneous examination of all the trees standing on a given area, say 40 yards square, or 100 roods, from which the increment per morgen may be ascertained at the same time as the rate of growth of the species. Often a sample area of rectangular form, say two or four times as long as broad, gives a more correct approximation of the mean of the forest growth, than a square area, and for this reason the former is preferable.

3. The situation in the forest of the tree under examination should be shewn by a rough sketch, with sides and angles marked approximately in figures, and accompanied by a short explanation.

4. *Altitude* is the height above the level of the sea.

When a sample area has been decided on, the exact position of this area, and of the tree, should be indicated in the same manner.

5. *Aspect* is the inclination of the land towards a given point of the horizon.

6. *Declivity* is the general slope of the ground. As regards declivity, land may be classed as follows: *Flats* 0 o/o, water remains stagnant; *Plateau* (if on heights), *Valleys* (if between hills), 0 to 4 o/o; *Sloping Ground*, 4 to 15 o/o; *Steep Ground*, 15 to 30 o/o; *Very Steep*, 30 to 50 o/o; *Escarpment*, 50 o/o and over. Declivity is

described by the term which characterises it, and registered at so much per cent.

7. *Shelter* is the obstruction offered by objects which deflect the course of winds or diminish their violence, and during a portion of the day intercept the sun's rays at the point under consideration.

8. *Winds*.—Those should be indicated which blow down, bend, deform or break trees.

9. *Soil* is that portion of the earth in which the roots develop. It is characterised by its ordinary degree of moisture; the disintegration, or cohesion of its particles; its nature and depth, and its quality; each of which properties should be systematically classified in the following order :—

State of Moisture.	Disintegration and Cohesion.	Nature & Depth.	Quality.
Swampy Watery Land Damp Land Fresh Land Dry Land	Compact Soil Well-divided Soil Light Soil Rocky Soil Stony Soil Gravelly Soil	Clay Soil Lime Soil Sandy Soil Sand Humus	Rich Soil Medium Soil Poor Soil

The typical term may always, if necessary, be modified by the use of such word as : *very, fairly, little, &c.* For example, *slightly* watery land, *pretty* well divided soil, *very* clayey soil, *rather* rich soil, &c.

10. Land is *swampy* or *marshy* when it is abundantly soaked with stagnant water, which is directly augmented by the rainfall, and diminished by evaporation and absorption, rather than by flowing away.

It is *watery* when the moisture which it absorbs is continually renewed by flowing in and out.

Damp when its ordinary state is such that a footstep will not actually cause water to appear on the surface, yet it is not perfectly dry under such pressure.

Fresh lands dry up on the surface during summer, but at a certain depth retain a quantity of moisture sufficient for the wants of vegetation.

Dry when liable to lose its moisture to a depth injurious to the roots.

11. Soil is *compact*, when with moisture it forms a greasy paste or putty, which adheres to the feet when trodden upon, and to the tools in working it; when dried up, it is very hard and cracks. In either state roots have much difficulty in developing in it.

A soil is *well divided* when it is easily loosened and yet retains sufficient adhesion between its particles, which themselves cling to the roots, and enable them to develop.

A soil is *light* when the division of the particles becomes very easy, and the cohesion between them is less firm.

It is *rocky* when on its surface, or at a slight depth, masses of rock are found forming its bed, and appear never to have been separated from it.

The soil is *stony* when it is commingled with isolated stones, or fragments of rocks, with diameter facets, or sides, varying in size from two to three inches to one to two feet.

It is *gravelly* when it is composed of an infinite number of small pebbles of a size varying from half-an-inch to about four inches in thickness, which are mixed or not with a more or less compact paste. The state of the soil with reference to its disintegration and cohesion may be given precisely, either by one single expression, for instance: *well divided soil*, or by uniting two expressions which will complete one another, for example: *compact and rocky soil*, *light and stony soil*, &c.

12. The nature of the soil should be specified by conjunction of the names of its constituent elements, first writing the name of the predominant mineral matter.

Clay is the greasy paste of almost all soils.

Lime results from the disintegration of limestone, which, when burnt in a kiln, furnishes the lime used in the composition of good mortar.

Sands are small mineral particles, hard and insoluble.

Humus is the natural mould formed by the decomposition of the leaves of trees fallen to the ground.

This being understood, a soil composed of more clay than sand, and abundantly enriched with mould, should be described as *clay sandy, containing much humus*.

Depth is intended to express the distance below the surface to which the roots are able to penetrate in order to obtain nourishment. This is very apparent in spots where a tree has been up-rooted by the wind; the same appearance can always be obtained by making a hole in the ground with a spade.

It is convenient that the figures expressing the depth, should be followed by the description of the bed on which the soil rests in which vegetation is growing; it may be described, for instance, as "sandy clay, with a sufficient quantity of humus, three feet in depth, to bed of pot-clay," or "three feet in depth to bed of flat rock, sand-stone," &c.

13. The value of a soil depends upon its degree of richness, and hence its suitableness, or otherwise, for producing vegetation remarkable for its luxuriance and size, when temperature, moisture, and shade permit.

After stating the particulars enumerated and explained above, the local expressions generally applied to similar lands should be given, for instance: heavy soil, cold soil, &c.

14. The state of the head or crown of a tree should be described by noting its average diameter, and the area vertically covered by it.

The grouping of surrounding trees should also be carefully noted.

When the head is not completely isolated, the names of surrounding trees should be mentioned at each aspect, and their relative situations stated; (the crown may be either dominated, rising with evenness, rising above, closed in, sheltered or supported).

15. The approximate length and condition of the bole should then be noted. If any gourmand branches appear, their position and size should be stated; also how it is surrounded, whether exposed to or sheltered from the action of the sun, and how the butt is covered.

16. Each tree under observation should be :—

- 1st. Stamped with a special mark, so that the wood-cutters may not cut it down.*
- 2nd. Numbered in a legible manner on the bark.
- 3rd. Surrounded by a measuring tape at the point where the trunk begins to take a regular form, (usually from three to four feet from the ground) this ribbon being kept perfectly horizontal all round.
- 4th. Marked under the ribbon with an adherent substance (pencil, colours, &c.), or by a distinct scratch on a dry portion of the bark of the tree, in order to be quite certain that future measurements may always be taken at the exact point where the circumference was previously ascertained.

After that, the circumference measured should be written down, and the ribbon taken off.

17. As far as possible, measurements should be taken at the beginning of the winter and beginning of summer in each year, say, about the 1st of April and 1st October. The date of measuring, and the character of the past season should be carefully noted.

At the time of each new measurement, a fresh "miroir," with stamp, should be made six inches above the preceding one. These "miroirs" thus fixed periodically will be guiding marks to ascertain if the same number of ligneous rings is formed every year.

18. On the register of growth, a blank line should be left between two successive entries of date and measurement.

OBSERVATION OF FELLED TREES.

19. The examination of felled trees for registration on Form D, should be conducted in the same order as in the case of standing trees; after the name of the species, the origin of the tree should be given (seedling or coppice). Aspect and declivity, nature, depth, and quality of the soil should be similarly stated.

* It will be advisable to cut out a small piece of the bark, care being taken not to injure the ligneous tissue, then to stamp the bared part. On felling the tree this stamp, called a "miroir," will determine the number of rings formed from the day on which the tree was stamped.

It should also be stated whether the crown was isolated or surrounded; the diameter of the crown, and the area covered by it, should be given approximately.

20. The height of the stump left on the ground, and the notch where the tree was marked for felling, should then be measured; also the serviceable length of the bole, the damaged length, if any, and the height of the crown. The addition of these lengths should be stated, thus giving the total height of the tree.

21. The thickness should then be ascertained, the average diameter, and the circumference noted, at the place on the stem when the tree was cut down, and the height of this point above the soil.

The diameter of the heart and the thickness of the sapwood at both edges of the diameter under notice should be given, and the double thickness of sapwood added to the diameter of the heart will be the total diameter of the woody part in that end.

The same measurements should be taken at the second and third sections, if there be such, noting the distance of each of these sections from the preceding one.

22. The use to which the tree is to be put should be noted, and if suited for a special use, the fact mentioned.

23. The rings should next be counted at the thick end, and the number of those forming the sapwood, and the total number taken down.*

It generally happens that the growth during a certain period of the life of a tree is sensibly larger than during the period which precedes and follows that period. In such case it should be noticed between what rings these large growths occur, the diameter of the central part of the tree preceding these largest rings, and the diameter reached at the point where the rings resume their average dimensions.

* Besides that, each ring includes two distinct formations—spring and autumn wood. The annual rings of growth may be subdivided into two or more divisions by narrow rings of harder and more compact tissue, but similar to that of the outside, and complete annual rings. This formation is entirely due to distinct vegetative efforts, that is, to the stoppages and fresh movements of the sap during the same year.

These subdivisions are, however, less distinctly marked than the annual rings themselves and usually have not the same evenness. In tracing them through their courses they become smaller and smaller and gradually disappear.

At the centre a small area will generally be found, on which it is scarcely possible to count the rings, for either decomposition has begun, or the rings are not apparent.

The diameter of that part should be stated, and the number of years representing the age corresponding to that dimension approximately estimated.

The examination of the thickness and height of the young plants in its vicinity, if any be found, of which the ages are known, will generally afford suitable data for the above estimates.

It is a good plan to draw a line in pencil on the section, showing the average diameter, and to mark on it the points at which the number of rings counted should be noted down. Sometimes it will suffice to divide this diameter into equal intervals of say 3 inches, from the centre point to the sap-wood, and from sap-wood to bark.

The layers between these spaces should be counted and a table drawn up similar to the following :—

DIAMETER.

Left radius from pith.	Number of rings.	Right radius from pith.	Number of rings.
3 inches		3 inches	
6		6	
9		9	
12		11 Sap Wood	
14 Sap Wood		12	
15		15	
18		18 Bark	
20 Bark		19 $\frac{1}{4}$	
21 $\frac{1}{2}$			

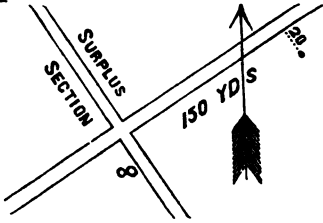
**EXTRACT FROM REGISTER OF STANDING TREES.
FOREST OF GOUNA.**

Parcel or Plot : Outside of Section.

Description : Stinkwood (Seedling).

No. 8.

Spot where the Tree is situated : About 20 yds. to right (E.) of road to Yonkersberg Mountain, and about 150 yards beyond the limiting path between the Section 8 and the surplus of the Forest.



Date of the Measurement.	Circumference at 3½ feet of the Ground.	Average weather during the period between 2 measurements.	REMARKS.
Nov. 15, 1882	28½	.	<p><i>Altitude</i> : 1,000 feet. <i>Aspect of the ground</i> : West. <i>Declivity</i> : ½ p.c. (plateau). <i>Shelter</i> : Sufficient. <i>Winds</i> : N. West. <i>Soil</i> : Fresh, well divided, sandy clay with much humus ; depth, 2 feet to bed of pot clay and stones, rich. <i>Top</i> : Very good, protected on the West by a slight contact with Ironwood and a Klipels, which it surmounts; isolated in other directions but the surrounding clearance sheltered by the shade of various trees. <i>Stem</i> : Vigorous ; height, about 62 feet to the crown, and 42 feet up to the start of a few small "gormand branches. A wound produced by the friction of another tree at 5 feet off the ground. It is very much surrounded by underbushes, with dense foliage.</p>

FORM FOR OBSERVATION OF FELLED TREES.
FOREST DEPARTMENT.

AGE AND GROWTH OF THE TREES.

Sheet No.

Forest of

Parcel or Lot :

Description of wood :

felled by

on the

188

License No.

Name of Describer :

REMARKS:

INFORMATION FOR ANSWERING THE QUESTIONS.

Transcribe the answers over the space underlined.

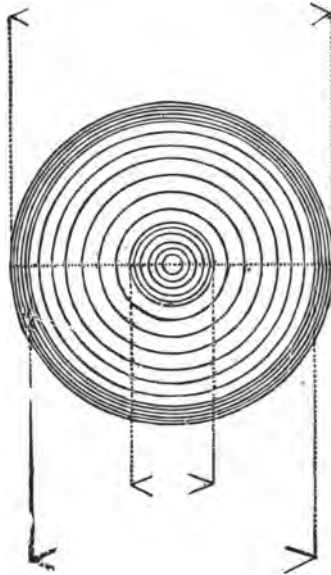
- 2 (a) To be indicated approximately per 100, and to be classed : *Flat*, 0 o/o ;
Plateau or *Vlei*, 0 to 4 o/o ; *Sloping Ground*, 4 o/o to 15 o/o ; *steep*,
 15 o/o to 30 o/o ; *very steep*, 30 to 50 o/o ; *escarpments*, 50 o/o
 and over.

- 3 (b) CLASSIFICATION OF FOREST SOIL :

State of Moisture.	Disintegration and Cohesion.	Nature and Depth.	Quality.
Swampy Land. Watery Land. Damp Land. Fresh Land. Dry Land.	Compact Soil. Well divided Soil. Light Soil. Rocky Soil. Stony Soil. Gravelly Soil.	Clay Soil. Lime Soil. Sandy Soil. Sand. Humus.	Rich Soil. Medium Soil. Poor Soil.

- 4 (c) (Whether in full growth, stationary, or decreasing in growth.)
 12 (d) Whether for planks, beams, or special work.

14 }
 15 } (e)



- 19 (f) To answer this question, the height of the stump remaining above the
 ground must be accounted for.
 24 (g) For Stinkwood and Assagai, etc., it must be mentioned whether the growth
 of the tree was from the stump or seedling.
 For all trees, especially Stinkwood and Ironwood, width of the Duramen
 (heart) and of Alburnam (sap wood).

QUESTIONS:

SPECIES OF TREE (g).

REMARKS:—

1	Aspect of the ground:	_____
2	Declivity: (a)	_____
3	Soil: (b)	_____
4	State of growth of the tree examined: (c)	_____
5	Was the top of the tree ISOLATED OR SURROUNDED by trees, or recently felled?	_____
6	{ Height of the Stump	_____
	{ Height of the Notch	_____
	{ Serviceable Length	_____
	{ Damaged Length	_____
	{ Length of the Crown	_____
	{ Total height of the tree	_____
7	Diameter of the Crown	_____
8	{ Average Diameter at 1st Section at _____ feet from the ground _____ Circumference	_____
	{ Heart _____ † Sapwood, two widths _____ total _____	_____
9	{ Do. of the middle: at _____ feet from the 1st Section, Circumference	_____
	{ Heart _____ † Sapwood, 2 widths _____ total _____	_____
10	{ Do. of the small end: at _____ feet from the 2nd Section, Circumference	_____
	{ Heart _____ † Sapwood, 2 widths _____ total _____	_____
11	What purpose does the Woodcutter intend to use this Timber:	_____
12	This timber could be used for: (d)	_____
13	Number of rings found at the thick end: Heart _____ Sapwood _____ Total _____	_____
14	(e) The largest rings are found between the	_____
15	and the	_____
16	(e) The largest rings are _____ inch.	_____
17	(e) Diameter of the ring where the largest rings begin:	_____
18	(e) Diameter of the ring where the largest rings end	_____
19	Width of the part of the heart, where the rings cannot be seen:	_____
20	(f) This part denotes a prior age of:	_____
21	Age according to the number of rings:	_____
22	Probable full age of the tree:	_____
23	Thickness of the bark	_____
24	Number of rings found at the small end: Heart _____ Sapwood _____ Total _____	_____
	Estimation by load of the remnant of the tree on the ground, Timber deducted	_____
	Period of vegetation (is the tree shooting, in flower, or in seed)	_____

REMARKS:

INSTRUCTIONS—No. 6.

EXTERNAL SIGNS OF MATURITY AND SOUNDNESS, RESTRICTED DEVELOPMENT AND DEFECTS.

In order to properly mark a “coupe” it is necessary to distinguish trees in full activity of growth, trees which have reached maturity, and trees on the decline, and to recognise the exterior signs of these different stages.

Further, in order to value the trees marked, the quantity of sound wood they contain must be judged, which requires a knowledge of the exterior signs of sound wood and of the symptoms of blemishes and diseases which may affect the bole.

External signs of maturity vary according to species, climate, and soil, but their general characteristics may be summarised as follows:—

A cessation of growth in the height of the tree at its summit; the flattening of the crown in consequence of the developing of the large branches at the top; the appearance of dead twigs in the branches; the conversion of smooth into rugged bark, generally of a different colour.

The shape of the stem varies with species and situation, but individual trees of the same species in the same situation almost always undergo similar changes. The stem of a young tree is more conical than that of an old tree. As it grows and, generally, approaches maturity, its trunk becomes more and more cylindrical, that is, it has a tendency to become of the same thickness at both extremities of the bole, from the point at which projecting roots disappear, to the point where the larger branches of the crown commence. Further useful indications may also be drawn from the size of the tree being taken into consideration with other symptoms, especially regarding the circumstances under which it has lived. The fact must not be lost sight of that a small tree on arid soil, or one dominated since its birth, may be as old as a tree of large dimensions, growing alone in rich cultivated soil, which may still be relatively young.

At maturity the leaves are smaller, coriaceous*, the openings between the foliage are increased, and the crest of the tree is not very bushy.

It is by considering these symptoms as a whole, and not singly, that a conclusion may be arrived at whether a tree should be felled or not, always considering each one independently of its usefulness at the place where it stands.

If the tree (supposed to be maintained under certain conditions) suffers not only small but large branches to die from slow continuous decay, and not from the sudden effect of any external or accidental cause (such as wind, isolation, insects, &c.), it is because the circulation of the sap is enfeebled by age, and we may conclude that the tree is on the decline.

But this conclusion is not to be inferred in the case of a tree growing in the middle of a dense mass with its trunk surrounded by undergrowth, and its crown shaded by those contiguous to it, which is suddenly isolated on one or more sides by the felling of adjacent timber. Its trunk, stimulated by a stronger light, puts forth luxuriant branches formed principally by the ascending sap. These branches are called "gourmandes" (epicormic branches, gormandisers).

The sap thus partially diverted and absorbed in its course, has not sufficient strength to ascend into the ramifications of the crown. There is no longer a sufficiency for this purpose, and the crown withers and dies, although the tree may not be mature or declining.

But if the shade be restored around the trunk by a fresh growth of under-wood, or by the development of crowns in its vicinity, and if the shade thus afforded is sufficient to stifle the gourmand branches, or if they be cut off, then the crown renews the vigour of its youth.

Trees exposed to the action of violent or uncertain winds, have dead branches at all ages. This always happens

* Sometimes their dentate edges, wavy surfaces, wrinkles, and epidermic expansions, become smoother and smoother, their edges more united, and the leaf itself becomes harder and more like leather (Holly, Saffraan, &c.), but these signs most frequently indicate the transition of a tree from infancy to the adult stage (blue gum).—This remark only refers to leaves of normal growth, and not to gourmand branches, or shoots subsequent to felling, which on the contrary, present all the characteristics of the leaves of young trees.

when the head attains a height at which it is no longer sheltered from atmospheric currents.

Storms, in destroying foliage developed during fair weather, often result in the death of the branches which bear the leaves, although other branches may survive or fresh ones be found, growing side by side, or even above those which are dried up.

This is very often the case with trees growing at the edge of a forest, on private properties or roads, and often in Avenues planted in places exposed to the wind.*

Insects may also attack trees at all periods of their existence, and cause the death of one or more large branches, or they may eat away the leaves.

A sound, mature and well-shaped tree presents the following appearances :—

1. Foliage of bright green colour, leaves uniform, small and hard, according to the species to which it belongs, with certain tendencies to group, and to leave spaces between the groups. Larger and more succulent leaves at certain periods would not be a good sign.

2. Stem quite round from the point where the buttresses of the roots cease, or perhaps exhibiting small channels characteristic of the species, parallel to the axis, and insignificant when compared with the total diameter. Full sounding when struck with a heavy body.

3. The portion of the stem between the root and the head, of cylindrical form or a regular taper, and in all cases free from holes, snags or knots, protuberances, branches, or twigs.

4. Bark of a colour, appearance, texture, and uniform adherence, characteristic of health ; the direction of fibres and clefts parallel to the axis of the tree, denoting straightness in the grain of its wood. An entire absence of blemishes, stains, or fungus, and as little lichen and moss as may be compatible with the species, situation, and age of the tree.

* The foliage of trees at the edge of a forest is often surmounted by bare dead branches, rising like the horns of a stag from their crowns, whilst trees entirely isolated in exposed hedges, or avenues, frequently present a broken appearance, vulgarly called the " Witches broom."

The following signs, on the contrary, are considered symptoms of defects or disease :—

1. A flat or swelled appearance on one side of the stem is indicative of an eccentric heart, and consequently of irregular formation of the grain.

Bark split in spiral threads denotes the same formation of grain throughout.

2. Bark dull and blotchy, especially if split or channelled, extending deeper than the periodic shedding necessary for the normal conditions of its existence ; scales or thin plates showing a tendency in the wood to puff up ; large red or white stains breaking the uniformity of the colour ; all these indications denote an infiltration of water, or an effusion of sap into the interior.

3. The presence of fungus on the bark ; an excessive quantity of lichen or vegetable parasites, generally denote internal decomposition more or less advanced.

4. Holes made by birds usually imply soft wood, and often indicate the presence of highly injurious insects.

5. The presence of eruptions ; scarred branches ; rotten knots partly grown over and called “ bull’s-eyes ” ; holes or cavities containing water on the trunk ; the exuding of matter ; dust proceeding from small holes between the roots ; are all indications of internal decay.

6. Warts, woody protuberances ; circular excrescences, whether having twigs growing on them or not ; bulging of the bark in the direction of the grain ; generally denote defects, decay, or splits inside. The same are to be feared when small full-leaved branches appear on the stem. They are signs of red and decomposed wood.

7. Often high winds may have caused rents at the junction of two branches, and new tissues may have formed around the gash. A hole is thus made, called a *trough*, in which the water collects and penetrates into the trunk. Troughs, though even of old standing, and exhibiting only marks left by the stagnation of water in the axils of the branches, indicate that internal decay is to be feared.

8. Trees struck by lightning are generally split up inside and cannot supply serviceable wood.*

9. A pale colour of the leaves, and their early fall (excepting from dryness or abnormal heat), shows that the roots are not healthy and cannot penetrate into the soil. In this, as in previous cases mentioned, the tree should be probed with a thin sharp instrument, especially at the depressions in the stem near the ground, and the trunk struck with a heavy body at doubtful places, and the sound returned carefully observed.

INSTRUCTIONS—No. 7.

INSPECTION OF WOOD.

Wood is inspected with the general view of determining its suitableness or otherwise for various requirements, and to ascertain if it fulfils the special conditions of certain contracts.

After an inspection, a decision on stated grounds can be definitely arrived at, as to whether the wood should be rejected, or admitted and classed in its proper category.

For this purpose a set of tools is required comprising:—

- a. *Measuring Instruments*.—Graduated tape, two foot rule, and diameter gauge.
- b. *Boring and cutting Tools*.—Saw, hatchet, awl, stiletto, and auger.
- c. Water can, sponge, and rags.
- d. Tools for marking and numbering the logs, stamping hammer, pincers, paints, brushes, &c.

The manner of proceeding is as follows:—

1. A general survey is made of the surfaces and both ends of the log. If there is any suspicion of a

* Professor McOwan says:—

“An instructive example occurred in the 90-foot historic gum tree lately taken down in the Botanica-Garden. It was killed by lightning in April, 1882. On felling and sawing it into sections for blocks in 1884, the blocks were found all split into ten or twelve radial crevices, extending star-wise from centre to circumference.”

serious fault, likely to cause rejection, its nature and extent must be immediately determined.

2. By stretching the tape on the upper surface, the exact length of the log should be ascertained and noted down.

3. In measuring the length, note should be taken of the grain of the wood, and its inclination to the axis estimated at so much in the yard. Note should also be made as to whether it is perfectly straight on this side, and if curved or crooked, the extent of its bend per yard.*

4. If there are any knots the position and nature of each should be stated. Those which do not appear serious should be smartly struck and the sound noted.

Those which may in appearance be sound, are not perhaps perfectly firm and adherent. Sometimes water penetrates into the circular fissures which surround them, and they develop into a kind of stopper on a part which is soft or hollow, through red, white, or grey rot.

By the act of striking a blow, the knot is very often detached, and driven into the decomposed cavity. It then becomes a "drusy" knot.

Such knots should be bored into, either with an awl or auger, as far as the sound wood. The nature of the decomposition should be exactly noted, and also the depth at which the wood is found to be free from contagion.

All defects should be noted. Rindgall, dry rot, weather damages, &c.; the presence or absence of fungi and worm holes, and if there are any, their nature and dimensions in either heart or sapwood; the state of the sides of splits, &c. Rotten or doubtful parts should be tested with either an auger or hatchet, and worm holes measured. Splits on the surface should be examined; their position, length, size of aperture and depth noted; channels and flaws should at the same time be observed.

* In France the Admiralty admit as straight, all logs which have a bend of less than 20 millimetres per metre in length *i.e.* a little less than a quarter of an inch per running foot (M. H. Nanquette, "Exploitation des Bois," 1866, p. 109.)

5. The square compass (diameter gauge) should then be applied to the upper surface at the small end, and its width taken and note made whether it is square, rectangular, or what the obliquity of its sides. Dimensions of wane edges on each side should also be noted.

The same measurements should be made at the middle, and at the other end of the log, and wherever else it may appear necessary.

6. The thicker end should be carefully examined; if dirty it should be washed, if dry it should be moistened, and if necessary a section should be sawn off.

Note should be taken as to whether the heart is in the centre or at one side, and in the latter case its distance from each surface should be measured. If it has more than one heart this fact should be mentioned as well as the centre bark ("entre écorce"). Exact measurement should be taken of the perfect or heart-wood, and of the sapwood. It should be stated whether the heart-wood is harder or softer than the sap-wood, and the reason for it. All defects which occur should be noted down. The length, depth, and width of apertures; of splits, cup shake, star shake, lunure; red rot and stains; also the structure of the splinters; the presence or absence of fungi or their spores (mycelium).

7. The small end should be examined in the same way as the large one—care being taken to ascertain whether the defects which appear are continuations of those observed at the large end.

8. All the faces of the logs should be examined in turn, and the conformation of each noted as indicated.

To make a proper inspection, it is always advisable to cut the wood afresh at both ends with saw or hatchet, in order to carefully examine all knots, splits, and doubtful discolorations.

Often it is necessary to soften and wash the wood with water to restore it to its normal colour—there are certain defects which disappear entirely with drying, for instance "lunure," (involute rings of soft wood).

When a fault has been detected, and it is sought to ascertain its importance in the interior of the log beyond the results given by boring, recourse must be had to observations made when the tree was standing. According to its appearance then, and taking the species of wood into account, the cause of the disease will probably be traceable.

Boring, cutting or smoothing the timber afresh should always be resorted to when practicable, in order to show where one defect leads on to an extension of the disease, and it can do no harm to saw or bore the diseased parts.

Such parts add nothing to the value of the log, and only serve to communicate contagion to the sound wood. They should be removed as soon as possible, and the wood completely freed of them before being put into work.

EXPLANATIONS FOR FILLING IN NOTE BOOK.

To arrange the order of his descriptions the Inspector is always supposed to stand at the thick end, looking in the direction of the small end, and working from left to right.

In this position the 1st surface is uppermost.

The 2nd to the right of the 1st.

The 3rd „ „ „ „ 2nd.

The 4th „ „ „ „ 3rd.

If from any special circumstance it is necessary to work otherwise, the order adopted should be clearly specified.

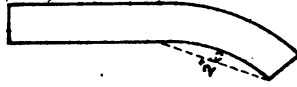
The following data should then be registered :

1. Number of the log.
2. The length of the log when the tape has been stretched on the surface under examination.
3. Total bend, if the curve is regular; the total bend by yard or foot of the greatest curvature if the log is crooked.

Examples : $5''/3$ yard ; or $2''/1$ yard.



3 yards.



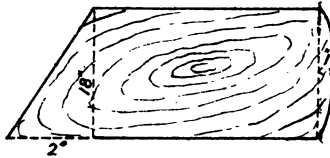
4. Deviation of the fibres so much per yard.

Example : $3''/1$ yard.



5. Obliquity, (falsely squared,) dimensions of part of which would have to be cut away to use the piece and make it properly square ; by two figures, for each defective side.

Example : $2''/18''$.
 $1''/18''$.



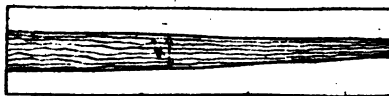
6. Total breadth measured at the middle of the surface (by one figure).

Example : $16''$.



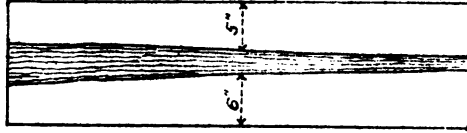
7. Breadth of heart at the middle of the surface by one figure.

Example : $4''$.



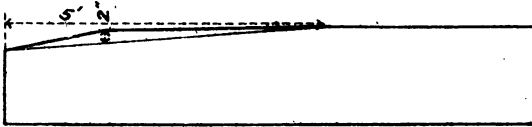
8. Breadth of Sapwood at left and right of heart at the middle of the surface by two figures.

Example : 6"/5".



9. Wane edges ; length and breadth on the left side, by two figures for describing a single angle.

Example : 2"/5".

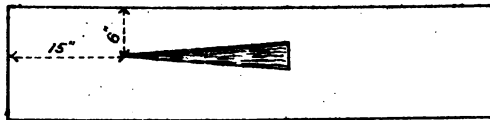


10. Names of noticeable faults (1).

11. Position of fault stated by two figures :.....

The first stating the distance of the large end from the beginning of the fault, the second the distance of this same point to the left edge.

Example : 15"/6".



12. Dimensions of faults in three figures :—

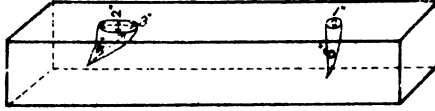
1st, the breadth ;

2nd, the length it measures on the surface ;

3rd, depth to which it penetrates. If only 2 are necessary the 1st should be the diameter and the second the depth.

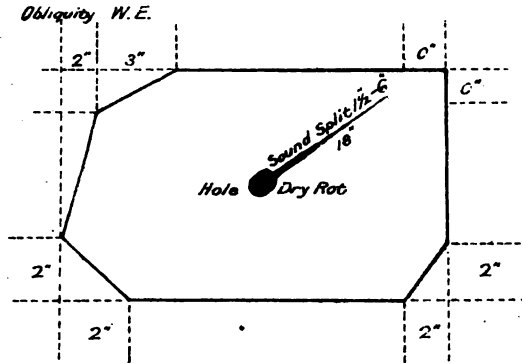
(1) Especially knots, splits, weather damages, centre bark, ringgall, red, white grey, and dry rot; worms, &c.

Example: $2''/3''/4''-1''/6''$.



13. The dimensions of the constituent parts of wood, at both large and small ends, described in the figure.

14. The defects sketched and their dimensions marked near the figure drawn.

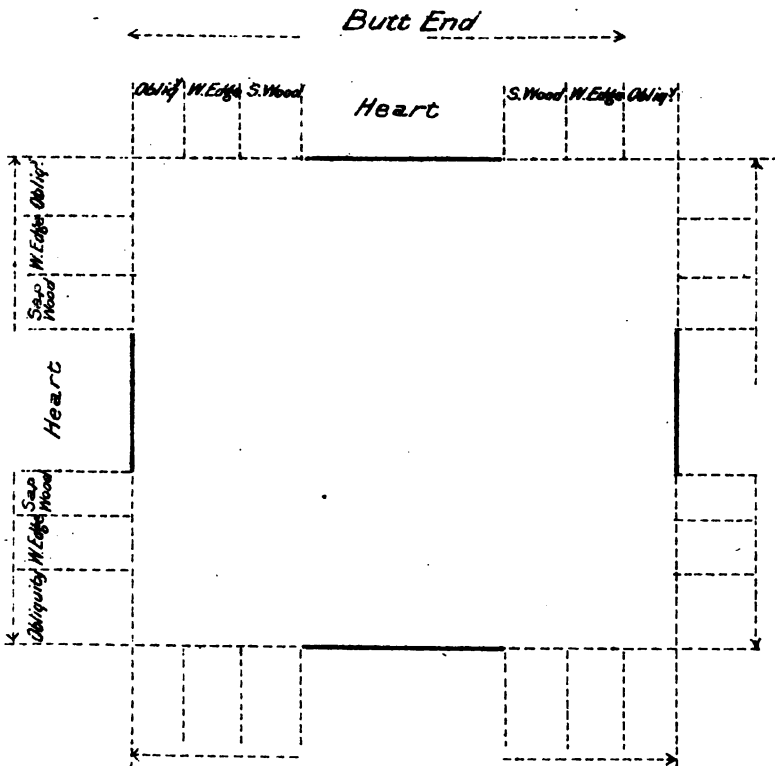


FORMS OF INSPECTION

NOTE BOOK.

No. Dimensions : Actual

Face.	Length.	Bend.	Deviation of Fibre.	Obliquity (False Sq.)	Width.			
					Total.	Heart.	Sap Wood.	Wane Edge.
1st								
2nd								
3rd								
4th								

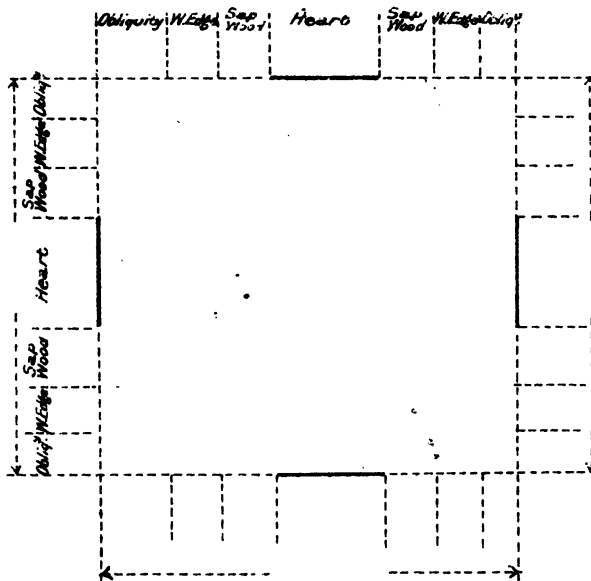


Passed for

Date

18

Splits, Knots, and Defects.			Remarks.
Nature.	Position.	Dimensions.	

Small End.

INSTRUCTIONS—No. 8.

DEMARCATON OF "FOREST RESERVES."

Preliminary.—Just as in order to render the land of any country valuable by means of agriculture, the first operation is to measure and mark off *farms*, that is, the areas within whose limits the agriculturist may sow, plant, and reap his crops; raise his cattle; and protect the interests concerned; so in logical sequence the first work to be undertaken in conserving and restoring forests is to accurately mark out those areas belonging to Government which should be set aside for production, exploitation, and forest culture, and the extent determined to which the necessary measures can be applied for their good management.

These areas are "Forest Reserves."

Instructions.

1. On principle forest reserves should include :—
 - a. Tracts stocked with wood (high forest, firewood, kiln-wood, &c.)
 - b. Tracts where wood has been cut or burnt, and leaving traces still visible on the ground; stumps, charred *debris*, or vegetation peculiar to burnt places.
 - c. Tracts required for the exploitation and preservation as forest, of wooded patches. This reserve necessarily includes the land requisite for the pasturing of cattle employed in hauling wood, and for establishing a right of way.*
 - d. Ridges and slopes immediately above wooded places.
 - e. Steep declivities near which the land is liable to be washed away by rivers.

* The necessity of this reserve has been proved by the questions which have been raised at Gouwana, in the Knysna Division, and in Tembuland.

At Gouwana all the land bordering the forest has been declared Emigrant Commonage without even being surveyed, and if Government had not retaken possession of one or two emigrant lots which give access to the commonage, nothing could have been taken from the forest without the permission of the emigrants. In Tembuland, farms have been sold and the timber reserved, but the questions of right of access and of depasturing cattle were not mentioned. The farmers have set up claims to stop wagons passing for the wood, and to prevent the cattle so employed from being depastured. Roads should therefore be marked out and arrangements made for outspans.

- f.* Places adjoining those on which wood would be useful to protect the soil from erosion by streams, rivers, or torrents.
- g.* Parts necessary to give a regular form to the perimeter ; including those long tongues of deforested land which stretch into a forest and constitute vulnerable points, giving an opening to wind and various dangers ; fire, cattle, &c.
- h.* Land necessary to complete an area decided on for reforestation ; whether on physical grounds, as, for instance, to equalise the flow of a spring or the course of a river ; or on economic grounds, as when the production of railway sleepers, &c., is contemplated.*

These measures should be carried out with tact and discernment.

2. Officers directed to make demarcations should therefore first rapidly examine the perimeter, including the area to be classed as Forest reserves.

At places where the forest is bounded by private property, the beacons fixing such boundaries must be considered and respected, and dividing lines of private property touching the perimeter, must be mentioned. The character and names of such properties and houses should be noted down, also the names of the owners.

At places where it is surrounded by Crown Land, the perimeter of the Reserve should be marked out by posts and, if possible, by cairns, at all the angles. These points or stations, whether old or new, should be numbered in succession, and the numbers marked with coal tar on the posts or on one of the most conspicuous stones of the cairn.

3. When the perimeter has been demarcated by posts fixed at all its angles, the forest officer should immediately furnish his report. The Superintendent of Woods and Forests will then submit a request to the Surveyor-General, desiring that officer to cause an exact plan to be made of the reserve demarcated, such demarcation being of

* The conditions under which tracts of land should be reserved have been stated in the Report of the Superintendent of Woods and Forests for 1882 ; and the suggestions recommended by Parliament (House of Assembly, 26th June, 1882.)

obvious interest to both departments. In the event of this being inconvenient for the Surveyor-General, the work will be undertaken by forest officers in conformity with the following instructions, and as far as possible, with the general customs of the Surveyor-General's Department.

4. In advancing to fix the points of demarcation, the forest officer should, as far as possible, always keep the forest reserve on his right hand, and the outside land on his left hand. During this operation the officer in charge should sketch a rough map on which should be carefully marked and distinguished by their local names, the rivers, kloofs, ridges, roads, and foot-paths he crosses. He should also mark *wagon roads*, bridges, wooden houses, buildings of every description, and woodcutters' settlements near the forest, also distinguished by their local names.

5. To ensure the accuracy of the survey, a fundamental system of lines should first be fixed on the entire perimeter as a basis of operations; by triangulation if the area is sufficiently extensive and the features of the ground permit; or by a *closed* polygon.

The survey should be made by chaining the perimeter itself where it is formed by long straight lines, and by chaining the auxiliary lines, facing the perimeter, at places enclosed by curved or broken lines.

The auxiliary lines and perimeter lines followed in chaining, should together form a completely closed polygon. The curves or irregular lines of the perimeter should usually be fixed geometrically by a series of perpendiculars from the auxiliaries, and the position of wooded places within the perimeter similarly fixed.

6. Whilst making the survey and chaining the perimeter, or the dirigents, the officer should notice the distances which separate the accidental lines which have been referred to (Art. 4) which cross the perimeter, and take the necessary angles to ensure the exact direction on the plan, of private boundaries, and to fix geometrically (by off-sets for example), the roads and noticeable features which lie outside the perimeter.

7. Plans should be made on sheets of 30 inches by 20 on a scale of 8 inches to the mile. It is not an absolute

necessity that the North should be placed at right angles to the sheet, but it is advisable that it should be on the upper part of the plan. The direction of the terrestrial meridian should be indicated on the upper part of the plan, and marked by an arrow at the margin in black ink, with the words "True North" in large letters at its extremity. This arrow should be crossed by a line terminating with a fleur-de-lys with the letters M.N., indicating the Magnetic North. In addition to this, each plan should shew the angle made by the line of operation, on the extreme left, with the true North. This should be shewn by a short dotted line in red, adjoining the survey line, and the measurement of the angle stated at the opening in red.

The successive sheets should be carefully numbered, and their connexion shewn by a slight prolongation of the geometrical lines on the preceding and following plans, and the number of the plan stated on to which they join. In addition a plan should be drawn on a reduced scale shewing the entire forest reserve on a sheet of 30'' by 20'' to be added to the complete collection of plans of the same size.

8. In sketches, plans, and maps all perimeter lines, open or existing naturally, should be shown by a continuous stroke in black, the auxiliary lines by a broken line (- - -) or in red, and those it is proposed to open by a dotted line (.....).

The line of the perimeter should be bounded on the *outside* by a broad red line, and all wooded places marked inside by a green line.

The beacons of territories should be indicated by small open black circles, and those of private property by closed black circles; beacons, rocks, and posts by black crosses; mile stones by small closed black squares, and distances stated beside them in small Roman figures underlined.

Military beacons should be indicated by small broad arrows (↑), and the consecutive points marked in small arabic characters underlined; trigonometrical stations by small equilateral triangles.

Roads by a double black line; ditches or watercourses in blue; walls in red; wire fences by a dotted line in blue between two parallel black lines; palisades by small inverted

v's (AAAA). Roads, streams, springs, bridges, &c., should be drawn as far as possible to represent the objects themselves.

9. The scale should always be stated on each sheet or plan, also the value of each angle stated at its opening, and the length of all lines, whether measured on the ground or calculated mathematically, marked along them.

The consecutive numbers of cairns, posts, beacons, or rocks, forming successive stations for demarcation, should be written in Roman figures, parallel to the upper edge of the paper, and large enough not to be confused with other numbers.

In detailed plans survey measurements should only include the distance from one point on the dirigent line to that immediately following, and each distance deducted from the results obtained by chaining.

The total lengths should be stated about the middle of the lines in parenthesis.

The length of perpendiculars, too short to be treated in this manner, should be stated at the extremity of the side of the perimeter.

When the angles and sides are too numerous to be given distinctly in this manner, they should be repeated on double or larger scale, in the margin of the plan.

10. If the lines are still too small to write their lengths along, or near them, even on a larger scale, the stations should be numbered, and at the side of the plan a table drawn shewing the distance between stations and the angles made by the lines.

If the magnetic angles have been observed, the magnetic angle of each line should be stated, and the opening of the angle which this line makes with the preceding.

Example :—

No. of Stations.	Length in Chains.	Magnetic Angles.	Angles of each Line with the preceding.
1-2	450	36°	...
2-3	325	84°	228°

But this should not be done unless it is quite impossible to give the data near the lines themselves, and in the opening of the angles, or even on an enlarged scale in the margin.

11. When plans of demarcation are forwarded they should be accompanied by a draft of proclamation, describing in detail all the boundaries of the forest reserves demarcated. With this information the Superintendent of Forests will, after conference with the Surveyor-General, be enabled to cause a preliminary notification to be inserted in the *Government Gazette* containing the proposed boundaries. For two months following the publication of this notice the Civil Commissioner of the Division should be authorised to receive objections from persons interested, and refer them to the Honourable the Commissioner of Crown Lands with his views. After this period if any alterations are advisable they should be effected, and a proclamation issued by Government definitely fixing the demarcation lines.

If a short Act of Parliament be necessary for this purpose, measures should be taken for its submission in due course.

12. Immediately after the proclamation of the boundaries, the posts fixed provisionally should be replaced by beacons as prescribed by the law of the Colony.

INSTRUCTIONS—No. 9.

MANAGEMENT OF FORESTS IN SERIES AND SECTIONS, IN ACCORDANCE WITH REGULATIONS OF 1883. (“AMENAGEMENT PROVISOIRE.”)

General Considerations.

Management (“Aménagement”) comprises the arrangement of “coupes” and the regulation of works in such a manner that the annual yield of a forest may be as constant as possible, and that its production may be brought to the highest possible point. A complete and definite

management scheme embraces a series of operations which can only be successfully undertaken when the necessary resources, both as regards staff and money, are at command, and when the products of the forests are certain of being utilised.

There are pine forests in Europe, systematically managed, which annually produce nearly 14 cubic metres per hectare, or about 500 cubic feet per morgen.

According to the statistics of 1877, the annual revenue in cash varies from 53f. to 158f. per hectare, or between £2 and £6 per morgen.

M. Tassy,* the most competent man in France on the question of management, states that the average production of high forest properly treated, in that country, is 6 cubic metres per hectare, or about 200 cubic feet per morgen.

There can be no doubt this figure may be easily attained by the forests of the Colony when we consider that stinkwood grows more quickly than any species in Europe. At this rate the forests of the Knysna Conservancy, about 50,000 morgen in area, would produce 10 million cubic feet of sound wood per annum; say 5 million feet of serviceable wood, of which one-eighth, being stinkwood, would represent an annual return of £30,000; other timber and wagonwood, £30,000; total, £60,000.

Would the expenses for attaining this result amount to £20,000? Even then the investment would be still far from unremunerative.

When circumstances do not admit of a complete management scheme (*Aménagement*), a working plan may be framed to prevent the utter ruin of forests, and also greatly improve their value, thus in some measure approaching the condition in which it would be most desirable to see them.

Perfect management is the end in view of the Regulations of 1883, and, in awaiting it, a *preliminary* and *transitory management* has been proceeded with.

* "*Etudes sur l'aménagement des Forêts*," by M. Tassy, formerly Conservator of Forests, who, after having undertaken important missions on forestry in Algeria and Turkey, has filled with much distinction the high position of "*Vérificateur General des Aménagements*" in France.

Instructions.

2. In terms of the Regulations the forests are to be first divided into *Blocks*, each of which is sub-divided into a series of "coupes" for successive 'exploitation' in an endless rotation, and the block itself is called a "*Series*."

Series should be large enough to admit of their being formed into the number of sections required for a perpetual rotation, and so that the forest may not be open at too many points at the same time. On the other hand they should be sufficiently numerous that certain products absent in some sections may be found in others, and that a portion of the forest may always be open near wood-cutters' settlements and locations. They should be of such sizes that all may be treated similarly, and adapted to the same periods of revolution.

To comply with these conditions the area of the blocks in the same forest should generally contain 400 to 1,000 morgen of land.

3. In their formation consideration should be given : —

- a. To the natural features of the country ; places which are either impassable, or which there would be no object in crossing to haul out wood.
- b. To the directions taken by paths made by nature, joining a principal ride, and so leading to a main road (wagon, postal, railway, &c.).
- c. To the character of the land and the nature and age of the stock covering it.
- d. To open lands in forest reserves adapted for grazing cattle employed in hauling wood, and suitable for temporary or permanent settlements for wood-cutters.
- e. To farmers, wood-cutters, emigrants, or other inhabitants settled on farms, erfs, villages, or towns in the neighbourhood.

4. The first document indispensable for this work is a plan of the perimeter of the forest, which may be taken from a general survey map of the country, if such exist, or from a demarcation plan of the forest if already made ; or it may be specially plotted with the view to the arrangement of exploitations. In any case the plans should be

completed by filling in kloofs, streams, bottoms, water-courses, rivers, and the general conformation of ridges forming watersheds between their basins.

For this purpose a certain number of points must be ascertained geometrically, at the summits of ridges, at the bottoms, on the higher levels of escarpments, on slopes delimiting plateaux, and on their lower levels delimiting valleys.

5. A forest must be considered as divided into plots (parcelles) by the natural features of the country, by existing roads, or by imaginary lines drawn from a given point to another visible point (from a beacon of the perimeter to a post, rock, or conspicuous tree for example), lines which can be easily marked on the plan; and, if necessary, by narrow strips opened up in the forest. The main object is to clearly distinguish parts essentially different from each other, and to judge amongst such lines, which may be taken as limitations of homogeneous parts, in order to determine their boundaries and areas. Thus, at one place a kloof exposed to the South might be considered to form a plot, bounded by the higher extremities of its sides; at another place a portion of a Northern slope from a certain kloof to an imaginary line running from beacon No. — to a certain peak, and so on.

These plots should be only adopted provisionally until they have been inspected, when, if other lines appear preferable for separating similarly constituted groups, they should be adopted instead, and the boundaries of the plots (parcelles) definitely fixed.*

Each plot should be designated by a letter of the alphabet, and should have a local name.

An exact description of every plot so formed and inspected should be taken down and registered.

The description of each plot of forest land should include the following particulars:—

- a. The area of the part described and its boundaries.
- b. Altitude, general aspect, declivity, shelter, winds.
- c. Nature of the soil—characterized as explained in Instructions No. 5, page 36 (Growth of Trees).

* For instructions to be followed in parcelling a forest exactly, see page 80.

- d. Species, nature, dimensions, density, predominant age, and general distribution of the trees (Consistance du Peuplement).
- e. Probable causes of present condition of the forest; what has been done there; what could be done; what the forest is capable of in the future.

The first point of this paragraph explains itself. For explanations of *b* and *c*, see Instructions No. 8, page 36 (Growth of Trees).

The "Consistance du Peuplement" (stock), taken as a whole, should be specified in a word: seedling ("*jeune semis*"); thicket ("*fourrés*"); sapling ("*gaulis*"); low pole ("*bas perchis*"); high pole ("*haut perchis*"); young timber ("*jeune futaie*"); old timber ("*vieille futaie*").

A plot of forest is said to be in the *seedling* stage when stocked with young trees from the germination of the seed to the time when the plants begin to form lateral branches, and are sufficiently high to intercept the view.

It is in the *thicket* stage when formed of young trees which still retain all their branches.

It is in the *sapling* stage when the bole begins to form by the fall of the lower branches, and while the diameter of the stem is less than four inches.

It is in the *low pole* stage when the diameter of the stem at the foot of the young tree varies from four to eight inches.

It is in the *high pole* stage when the stem is more than eight inches in diameter until the trees have almost attained their full length of bole.

It is *young timber* when the trees have almost attained their full size in diameter.

It is *old timber* when it is fully developed and fully matured.

The consistency of a stock resulting from a treatment by natural or artificial selection, may generally be considered as belonging to one of the three following categories:—

- a. Old trees scattered in the midst of re-growth in various stages, classed according to the preponderant age, thicket, saplings, or low poles.

- b. Old trees numerous, usually dominating seedlings which only require opening out to flourish vigorously.
- c. Old trees very numerous, intermingled with trees of middle and younger age, approaching their greatest height, and forming altogether a canopy completely covering the soil. Either bare of re-growth, or, with only few sickly plants, stunted by the continuous influence of a too dense covert. (According to M. M. Parade, Nanquette, and Bagneris: *Fernandez and Smythies' translation*).

This description should be followed by a statement of trees ready to mark per morgen, the proportion of principal "essences," and the quantity of wood they should yield.

The number of trees of middle age (say to mature in 40 years) which are reserved, and the proportion of different species.

The condition of the re-growth.

This should be followed by the information required in section e, (causes, and prospects).

EXAMPLE.

Plot B (White Heath).

Extent.—About 40 morgen.

Boundaries.—N. Forest surplus.

E. Perimeter.

S. Main road to Zitzikamma.

W. Ferns Rivulet.

Altitude.—1,500 feet above the level of the sea.

General aspect.—S.E.

Declivity.—3/10 plateau; S. 3 per cent. 2/10 sloping ground; N.W. 10 per cent. 5/10 sloping ground; S.E. 12 per cent.

Shelter.—From N. to W.

Winds.—S.E. prevalent, effects slight.

Soil.—Fresh land, well divided; sandy clayey, with humus, 1½ feet deep to bed of clay, rich.

"Consistency."—Old timber, matured, decaying, or over-crowded.

Trees to mark.—About 40 per morgen, and should yield 1,000 cubic feet, viz. :—

Stinkwood,	8,	yielding	240	cubic feet.
Upright	15	„	250	„
Outeniqua	2	„	250	„
Assegai	6	„	90	„
Ironwood	10	„	120	„
Sundry	3	„	50	„
<hr/>				
	44		1,000	„

Add 20 poles and 30 spars.

Trees of about middle age to be reserved, 120, viz. :—

Stinkwood	...	...	12
Upright	...	...	18
Outeniqua	...	...	6
Assegai	...	...	16
Ironwood	...	...	18
Sundry	...	...	50
<hr/>			120

Add 120 poles.

Re-growth.—Abundant in places. Young stinkwood almost everywhere, but no poles of this species. Few others. Much underbush.

Causes of present state, and what may be hoped for in the future.—*Virgin Forest*, which when cut will reproduce itself as soon as the re-growth is opened out.

6. Statistics should be collected and grouped in three classes :—

Administrative conditions.

Physical Phenomena.

Economic conditions.

a. *Administrative* conditions—

Name of forest.

Situation (Division, field-cornetcy).

Title to the property (proclamation as Government Reserve).

Area, Beacons, Boundaries.

Rights and Privileges of other persons or public bodies.

Servitudes.

Usages.

Litigious questions.

Offences.

Prosecutions.

b. Physical phenomena—

Climate.

Temperature (monthly mean and extremes).

Rain and Snow (number of days with rain or snow, and quantity in each month).

Dew.—Frequency and importance.

Winds.—Storms, prevailing direction.

Soil.—Geological formation and characteristics.

"Peuplement."—Nature of stock of trees, general character of forest growth, and enumeration of products.

Character and rate of growth of principal trees.

Proportion of sound to unsound trees.

Average dates of flowering, seeding, shedding of leaves, and the breaking out of young leaves of the principal species.

Periodical seeding of trees.

Causes of injury.

Effects on vegetation of—

Fires.

Grazing.

Insects.

Game.

Creepers; euphorbia, parasites.

Extreme temperature.

Drought, &c.

Improvements desirable.

c. Economic conditions—

Nature of contiguous properties.

Centres of population : their requirements, and their ability to provide for the working of the forests.

Means of transport.

Pasturage for cattle employed in hauling wood.

Nature of forest products.—Timber, industrial wood, and minor produce.

Markets for produce.

Staff and Expenses necessary.

Settlements, locations, or buildings suggested.

7. This information being collected, and the division into plots (*parcellaire*) marked out, series should be formed by grouping assorted plots in the same block (areas 400 to 1,000 morgen). They would either be plots included in the same basin, bounded by mountain crests and spurs, if the ground is naturally adapted for the removal of wood from the slopes on the lower levels; or, on the contrary, would extend on a system of ridges, terminating in steep impassable river banks, if the directions of natural paths oblige wood to be hauled out by way of the tops of the ridges as is generally the case in the Colony. On the most convenient basis a scheme should then be prepared for dividing the whole tract of forest into series.

8. A similar scheme for the division of each series into sections should afterwards be proceeded with. The main forest road (existing or to be made) for the removal of wood should be taken as the principal line of division of a series into sections. On a flat country of unequally hard soil, it is advisable to let the principal lines pass through the driest places, and the division lines of coupes should lead towards the main thoroughfare, called in French forestry, "*laie sommière*."

The dividing lines themselves should, as far as possible, follow the direction of the lines at the higher parts of the ridge, or the lower parts of the kloof; or else perpendicular to them, so that the slope from top to bottom may be included in the same coupe.

When, however, a slope is crossed by a road, existing or to be made, it may form an advantageous line of division.

The area of sections should roughly be in the inverse

ratio to the quantity of wood contained per superficial unit of measurement, and to the producing powers of the plots (parcelles) of which they are constituted ; See Instructions No. 1, p. 7. Coupes should be formed and numbered according to the rules for locating coupes, stated below.

When coupes numbered 1, 2, 3, &c., are exhausted, either because all the timber has already been taken out, or from other causes, they are considered as already exploited and a beginning is made at the coupe bearing the lowest number of those not exhausted, and exploitation continued in numerical order.

9. The rules for locating coupes (règles d'assiette) are as follows :—

- I. *Coupes should be arranged in continuous succession, to be cut after each other in uninterrupted order.*
- II. *In shape the coupes should be long and narrow, and they should lie at right angles to the usual direction of violent winds : the wind should blow across instead of down them.*

The worst forest winds are those which bring rain and storms.

- III. *The order of cutting should be so arranged with reference to the prevalent wind that the first coupe is to leeward, and the last to windward. Thus each but the last has the protection of a mass of trees ; and the wind blows seed on to the new coupes from the old trees standing to windward.*

If the wind is not more destructive from one quarter than another, coupes should lie elongate from East to West, crossing the sun's rays from the North, and be worked in that direction in order that a long strip may derive benefit from the shelter afforded by the high trees in the following section.

- IV. *On the slope of a mountain the coupes should begin at the base, and proceed regularly towards the top of the mountain.*

This is the most favourable arrangement for natural reproduction, and usually, also for protection from wind.

- V. *Coupes should be so arranged that, as far as possible,*

the timber from a coupe being worked may be got out without being taken across, and damaging the growth in a coupe which has been cut over.

For this purpose it will suffice that a coupe should be bounded, or crossed by only one accessible path, along which wood can be slipped.

It is evident that cases must often occur in which one rule cannot be put into force without breaking another. The forester must then use his common-sense, and where two rules conflict, judge which is the most important.

10. Information and suggestions concerning the forest should be contained in a special book, to which an atlas is attached.

This book is divided into two parts :

The first part contains *General Statistics*, and is divided into three chapters.

Chapter *I. Administrative Conditions* ; comprises all the information collected (§ 6, *a*), and suggestions relating to this subject.

Chapter *II. Physical Phenomena* ; contains a general description of the forest, and reviews the various natural features remarked in accordance with § 6, *b*.

The observation of physical phenomena deals with the various elements of production as a whole ; their action and re-action on each other ; and points out the nature and importance of products it is possible to take from the forest.

Chapter *III. Economical Conditions* ; treats of the observation of the country, rather than the forest, according to information gathered in following instructions, § 6, *c*.

The object of this part of the book is to adduce all the existing reasons for attaining certain results which should be considered within the aim and scope of management.

General statistics demonstrate the motives which guide the formation of a working plan and the necessity of the suggestions made. Recommendations should always include directions for collecting more complete data in view of the formation of the perfect and definite plan of management to which these measures should lead.

The second part is headed *Management*.

Chapter I. *Division of the forest into series for exploitation.*

A tabular statement should be made containing the name of each series, its area, and the groups it contains.

Following this should be stated all reasons which have actuated the formation of groups, and when a different division may at first sight have appeared preferable, the reasons for not adopting it.

Chapter II. *The Determination of the Revolution* ; treats of the following points :—

The results of observations already made on the growth of trees, and those which still require to be made, to determine the ages for each species which correspond to each kind of "exploitability ;"

The "*exploitability*," which appears best adapted, under existing circumstances and local requirements ;

The duration of the revolution for each series which appears best to correspond with the conditions in which they are found ;

The approximate capability (yield, "*possibilité*") which may be expected ;

The consequences hoped for by the transition revolution, in ascertaining when it will be opportune to arrange a definite management scheme.

Chapter III. *Scheme for Exploitation or Working Plan* ; should contain suggestions regarding trees for reserves and trees for felling in the sections.

Concurrently with the opening of ordinary sections, during the first ten years it is often necessary to make cleanings and thinnings in other sections, and to remove old trees which cannot remain on the ground until the date at which the whole section will be opened.

A summary should be given of what it is proposed to do in such cases, with reasons specifying the urgency, and showing which trees may wait felling beyond the time indicated until a sale can be effected, and those which should at that time be cut down in the interests of the forests whether sold or not.

Chapter IV. *Improvement works* ; temporary cultivation, assessment, irrigation, slip-paths, wagon-roads, saw-mills, &c.

11. The Atlas appended should contain :—

- a. A plan of the entire forest, showing the most prominent features of the country, the configuration of the plots, and the arrangement of the series on a scale which will admit of its being drawn on a sheet of foolscap size ($12\frac{1}{2}$ by 16 inches).
- b. (b^1 , b^2 , &c.) When the forest is so large that on a single sheet the relative positions of plots and series can only be shown, this plan must be followed by others on a double or quadruple scale, cut into sheets of foolscap size, all of which are shown as rectangles on smaller scale in the general plan.
- c. (c^1 , c^2 , &c.) A diagram of each series, showing its division into sections on a scale which admit of its being drawn on a sheet of foolscap size.
- d. (d^1 , d^2 , d^3 , &c.) A diagram of the same size, of the sections it is proposed to open, showing the arrangement of the Virées, &c.

Each sheet should have distinctly marked upon it the name of the district, the field-cornetcy, and the block of forest of which it represents a part. Writing and figures should be arranged so that in reading the title, the details can be read without turning the sheet round.

Generally, the instructions on Demarcations (No. 8, page 62) should be followed as far as adapted to the sketching and drawing of plans and diagrams.

12. Each month forest officers engaged in surveying or management should furnish the Superintendent, through the Conservator, with a statement of the work done, and a proper report in proper form.

13. Before opening any sectional lines the officer in charge of the work should submit to the Superintendent of Woods and Forests, a sketch showing roughly the forest; the rivers; the proposed situation of the first series; the situation of the first and following sections to be opened.

14. The Conservator should take measures to prevent trees being wasted which have to be cut down in making surveys, or in opening lines of divisions, roads, and paths necessary for the removal of the wood.

He should dispose of such wood on his own responsibility to the best advantage, and keep a separate account of moneys so obtained, which should be considered a refund for the expenses of the work performed.

15. Management schemes, whose formation involves the voting of special funds for a certain number of years, should be submitted for the sanction of Parliament before being undertaken.

Memo.—Method for Parcelling a Forest Exactly.

To parcel out a forest exactly, a general inspection should first be made of the whole mass to be divided.

An examination outside the forest should be made of the boundaries, beacons, topography, hydrography, and adjacent lands. When necessary the aspects facing the forest should be paced from point to point wherever a large extent of forest is embraced in the view, and the relief of the ground, and the importance of the stock can be roughly perceived.

If the forest is on a level plain, and an extended view cannot be obtained from the outside, similar information should be obtained by traversing the paths and roads which intersect it.

A stand should be taken at a point of the perimeter known on the ground, and on the plan which should always be carried ; say, for instance, the opening of a road. The perimeter should then be followed, the forest being on the right hand, and the stock and the character of the land observed whenever a noticeable change occurs.

At such places the line should be followed which differentiates the two parts of the forest under examination.

The portions should be most minutely inspected of which the margins have already been followed on the perimeter.

The direction continued into the forest should be guided by the age, consistency, species, state of the stock, and relief of the ground, always keeping parts existing under

similar conditions, on the same hand (right) and thus the point of departure is again arrived at.

Whilst making this tour, trees should have been blazed at intervals, and the contour of the plot thus marked out.

To ascertain whether the interior of the plot is sufficiently homogeneous, or whether it contains portions which require forming into special plots, it should be re-crossed by a transverse line, and by a second if necessary, at right angles to the first, and so on for other plots.

In mountainous country it is ordinarily useless to make a tour of each plot. It is sufficient to ascend, and form large horizontal Virées, terminated by ravines, or other necessary boundaries.

When insensible transitions are met with, for instance, when the ages of trees gradually decrease from old high timber to high poles, on a slope turning insensibly from the S. to N.W., division lines should be made, not at an equal distance from the extremes, but at points where the treatment and periods of exploitation should change.

Divisions based only on the state of the stock exhibiting such differences which it is intended should disappear during the first revolution, are considered as sub-divisions of the same plots, and are indicated by the same letter followed by a numeral, for instance, A, A², &c.

The extent of plots should not be less than 5 or 6 morgen, or greater than 60 morgen.

If at first certain plots have been made too small, they may be added to others in the vicinity and considered simply an accident. If others are too large they can be divided.

An exact division of parcels should be followed by exact plotting, without which a true inventory of the forests cannot be made.

(According to Nanquette and Brouillard, *Cours d'Aménagements*.)

For Examples of Tables to be employed in a Preliminary Management Scheme, see three following forms.

FOREST OF
TABULAR DESCRIPTION OF PLOTS.

Plots.	Boundaries.	Altitude, Aspect, Declivity, Shelter, Winds.	Soil.	Consistency.			Regrowth.	Remarks.
				General Character.	Trees to be cut per morgen. Number and Species.	Trees to be reserved per Morgen. Cubic Ft.		
A.....								
B. White Heath, 40 morgen.	N. Surplus. E. Perimeter. S. Road. W. Ferns. Riv- ulet.	Altitude, 1,500 feet. G. Aspect, S.E. S.W. plateau, S., 3 o'clock. 2/10 S. Gr., N.W.. 10 o'clock. 5/10 do., S.E. 12 o'clock. Sheltered from N. to W. Prevalent Winds, S.E. effect slight.	Fresh land, well divided, sandy, clayey, with humus 1 1/2 feet deep to bed clay rich.	Old timber, matured, de- caying, over- crowded.	8 Stinkwood. 15 Upright. 2 Outeniqua. 6 Asegaai. 10 Ironwood. 3 Sundry. — 44	940 250 250 80 123 53 1,000	12 16 16 16 18 50 120	Virgin forest, which, when cut, will re- produce itself as soon as the re- growth is opened out.
C. and so on.					20 Poles. 30 Spars.	... 120		

FOREST OF FORMATION OF SERIES AND WORKING PLAN. SERIES OF

Plots.			Sections.					REMARKS.
Designation.	Extent.	Predominant age in 1885.	No.	Extent.	Date of ordinary Coupes.	Date of extra Coupes.	Date of Thinning.	
A.	22 morgen	Mixed.	1	morgen. 22	"	"	1887-91	Wood already worked to be equalised by thinning at the first opportunity within a period not exceeding five years.
B. White beath	40 do.	do.	{ 2 3 }	20 20	1886-7 1888-9			Coupe of over mature and decaying trees to favour the development of trees of middle age and in the <i>high pole</i> stage.
C.	11		{ 4 }	19	1888-9			etc.
D.	8		5		1889-90			
E.			6					
etc.			7					
			8					
			9					
			10					
			11					
			15					
			16					
			17					
			18					
			19					
			20					
								Old trees decaying cannot remain standing until date of ordinary coupe and be removed without injury to others in the vicinity of the management lines of division.

WOOD AVAILABLE

Each year in accordance with the working plan.

Date.	Nature of Coupe.	Probable Produce.			
		Stinkwood.	Yellowwood	Sundry.	Poles and Spars.
1886	Ordinary Coupe	c. f.			
	$\frac{1}{2}$ Section No. 3	2,000	12,000	16,000	2,000
	Removal of decay- ing trees in Sec- tion No. 20.	800	400	1,500	500
	Thinning Section 1	..	200	1,500	100
1887		2,800	12,600	19,000	2,600

INSTRUCTIONS—No. 10.

CLAUSES AND CONDITIONS OF SALE, AND “EXPLOITATION” * OF WOOD IN SPECIFIED BLOCKS OF CROWN FOREST.

Art. 1. The wood acknowledged to be available in the Crown Forests shall be sold every year in block where it is practicable (Government Notice No. 406, 1883) by public auction or private contract.

The deeds of sale shall be drawn up according to the usual colonial custom, where not otherwise specified in the present conditions, at the expense of the purchaser.

Art. 2. In private sales all buyers will be allowed a commission of 25 o/o on the total value of the lot of trees marked and valued at current tariff rates. The same abatement will be allowed in fixing the upset or reserved price of auction sales.

Art. 3. Sales under £5 will be for cash, but the purchaser in every case will have to provide security approved by the Conservator as a guarantee for the execution of the conditions of the “Exploitations.” In all sales exceeding the value of £5, the purchaser will have the option of paying cash with a discount of £5 per cent., or in four promissory notes payable at the office of the Civil Commissioner on the

†1st July
1st October,
1st January,
1st April,

succeeding the date of sale. In case of sale by instalments two approved sureties will be required, and the purchaser shall not receive more than one quarter of the timber in the coupe before the first instalment is paid.

In the event of the purchaser not paying the amounts as they become due, the felled timber may be immediately

* “Exploitation includes: 1st, felling; 2nd, cutting up, and squaring of timber; 3rd, removal from the Forest.

† If the sale take place after the 1st July, the first payment must be made on 1st October, and the others at intervals of 3 months, and so on.

seized, the agreement cancelled, and the section re-sold at the risk of the former purchaser.

Art. 4. The object of the sales will be to dispose of lots of standing trees, specified, stamped and numbered, within limited areas, excepting trees intended for reserves. Sales will generally take place between the 1st January and 15th of March in each year.

Art. 5. The area containing the trees to be worked every year shall be defined by lines opened up in the forests, and marked by piquets, and by trees which shall be stamped with a special brand.

Art. 6. In every space decided on each tree not stamped for felling is a "reserve" and shall not be touched on any account. The greatest care must be taken to avoid "abandoned"* trees injuring others when falling; of course "reserves" must remain, some not being "exploitable,"† others to give the necessary shade to young plants, and others as seed bearers.

If, notwithstanding the caution exercised, an abandoned tree injures a reserved tree in its fall, the purchaser should immediately inform the forest guard, who will, if necessary, stamp from amongst the abandoned trees an auxiliary tree for preservation, so that its influence may make up or complete that of the injured tree, and this new reserve should be cared for as the others.

In no case can the purchaser demand delivery of a reserve damaged by his "exploitation," but if the Forest Department wish, he may be compelled to purchase it at licence rates.

Art. 7. Trees of all species in season shall be cut regularly and in succession one after another, and the "abatage" (felling) in any case should not begin before the 1st April, and should be completed by the 31st August following the date of sale.

Within this period, if the Conservator deem it necessary to appoint any special time for certain species, he will notify the opening and closing dates for the different species,

* Abandoned, i.e., marked for felling.

† A tree is "exploitable" when it has reached its maximum of growth or utility.

at least eight days in advance, and giving not less than three months' time for felling, unless otherwise prescribed by special causes annexed.

Art. 8. As the work advances creepers should be rooted up and destroyed, the undergrowth forming obstacles to the removal of logs cut down, and remnants ranged in order. These operations should be finished before the expiration of the time allowed for felling.

Art. 9. Stinkwood, assegai, sneezewood and all trees which have re-growth from the stump should be felled as close as possible to the ground or point of separation if more than one stump but without interfering with the stump at the base, and the stool left so that water may not lodge in it and cause decay.

For other species the stump left on the ground after felling a tree must not be more than a foot in height from the highest part of the ground to the highest part of the stump.

Art. 10. Each tree should be cut up and removed as early as possible after it is felled, unless otherwise prescribed by special clauses inserted in the conditions of sale or by reasons set forth in Art. 7.

The felling shall commence 1st April (after the sale), and be completed by the 30th June; the "façonnage"* should be completed before the 30th August following the date fixed for completion of felling. Broken and jagged stumps should be levelled within the time fixed for "façonnage."

All wood which cannot be utilized, or other waste wood, should be stacked in parallel rows of 15 feet wide, separated by belts of equal width, thoroughly cleared. These rows of waste wood to be divided at intervals of 100 yards by cross paths of 9 feet, so as to allow a free passage.

Art. 11. The roads or paths passing through a "coupe" or locality where timber is being felled must be kept open so as to permit a free passage at all times.

Art 12. The purchaser is expressly forbidden to allow his cattle or those of his agents to graze in his "coupe"

* "Façonnage," cutting up and arrangement of the wood so that it may be inspected.

or in any other parts of the forest but those assigned to him.

Art. 13. The purchaser will be held responsible for all trees in his coupe; he will be called upon to pay damages for every tree unduly broken, burnt, or otherwise injured as fixed by Art. 13 of Government regulations.

Art. 14. To be relieved of the liabilities imposed by Art. 13 the purchaser must observe the following rule:—

A. In cases where it is absolutely necessary to cut down trees not stamped in order to reach those stamped and sold, the woodcutter in the service of the purchaser must point them out to the officer in charge, and request him to mark those trees it is necessary to cut down, which are of any use for poles, spars, &c. These the woodcutter must cut near to the ground, and lay in piles along the sides of the path at places indicated, and he must in every particular follow the directions of the officer in charge.*

B. Trees or branches damaged by the fall of those stamped to be cut, unless through carelessness, must be properly pruned and trimmed if they can still be preserved; but if the officer in charge is of opinion that they cannot thrive, they must be dealt with in the manner mentioned above.

Art. 15. When not otherwise stipulated, the purchaser besides other work specified in the conditions of sale, must supply one man's labour for one day for every morgen "exploited," to repair damage which must necessarily be done to the forest in cutting and removing the wood. This work to be done for the benefit of the Forest under the direction of the Conservator of the Division, who will choose the best man available in the most suitable season, and the purchaser will pay them on production of certificates given by the Conservator.

* If the ranger when duly requested, is unable to arrange beforehand, he should make an inspection as soon as possible afterwards in order to ascertain:—

1st. That he has cut only those trees, not stamped for felling, which it was impossible to avoid damaging in cutting down those trees stamped for felling.

2nd. That the trees thus felled have not been cut up into pieces of unserviceable lengths, but that serviceable lengths have been kept entire so that they can be used and granted under fresh licences, and that they have been ranged in proper order along the sides of the paths.

Art. 16. All the wood included in the sale should be removed, and the coupe cleared out by the 31st December following the date fixed for the completion of "fagonnage," and all wood left on the ground will, after that date, become the property of the Forest Department.

Art. 17. At the expiration of the time appointed for closing the coupe, it shall be inspected by the Conservator, or his representative, accompanied by a ranger, forester, or guard, and notification of the day of inspection will be given to the purchaser, or his representative, at least 24 hours beforehand if the purchaser lives within one mile of his "coupe," and 24 hours plus the lawful delay for distance if he lives farther away. The result of the inspection should be entered in a book, and a report made showing deficiency in the number or quality of the trees left, and damage done on this account.

A copy of this Inspection Report will be given to the purchaser should the "coupe" have been insufficiently cleared, or not left as it should be according to these conditions of sale, and the fact will be noted in the Inspection Report.

This report being duly signed by two forest officials and registered in the Conservator's office, the purchaser will be called upon to pay at the rate of $\frac{1}{4}$ d. per ten square roods of "coupe" per day until the coupe shall be put in order, and recognised as being so by a guard, forester or other local official duly authorised. If at the end of a month the "coupe" is not in order, the Conservator, on receipt of a fresh report to this effect, shall have the power, on giving forty-eight hours' notice, in writing, to take steps for having the work executed departmentally, and the cost of this work will be recovered as a forfeiture from the purchaser to be calculated as above, at the rate of ($\frac{1}{4}$ d.) one farthing per 10 square roods of coupe for the number of days which elapse until the "coupe" is put in order departmentally.

Wood remaining in the coupe will be sold by public auction at the nearest market.

The proceeds of this auction, and the forfeiture mentioned above, will be applied towards the cost of putting

the coupe in order departmentally, and any balance remaining in the hands of the Forest Department will be paid into the Civil Commissioner or the nearest treasury to be credited to forest revenue.

Art. 18. During the time that the "coupe" is being worked by the purchaser, he will be required to have a representative on the spot, who must be approved by the Forest Department, to give information and receive communications during the work. This representative must keep a book in which to enter instructions received from the Conservator, which must be produced on demand of the ranger, or other forest officials.

Art. 19. In all matters appertaining to the felling, cutting, fashioning and removal of the wood—the re-foresting of bare spots, and generally in all that concerns the due fulfilment of the conditions of sale, the purchaser will be held bound by the decision of the Conservator of Forests.

Art. 20. At the request of the Conservator the purchaser will be required to dismiss from work in the coupe any workmen who may be insubordinate, disobedient or unskilful, or against whom there have been previous convictions for any forest offence.

Art. 21. In all matters of dispute, whether with regard to the manner of carrying on the work, or anything touching the meaning of any matter, clause, or thing in the contract, the decision of the Superintendent of Woods and Forests will be final.

Art. 22. Should the purchaser object to this referee, arbitrators can be appointed by both parties, the purchaser paying all expenses connected with such arbitration.

} Purchasers.

} Sureties.

} Witnesses.

INSTRUCTIONS—No. 11.

TEMPORARY CULTIVATION OF BURNT AND DEVASTATED FOREST LANDS.

Preliminary Remarks.

It frequently happens that certain parts of burnt or devastated forest land require tilling before they can be successfully reforested. In such cases it is beneficial to the forests, and advantageous to certain inhabitants residing in their neighbourhood, that agreements should be entered into for such forest culture.

The natural compost of burnt patches is usually exhausted by a continuous cultivation of seven years. It is desirable that this should not be entirely exhausted by such tillage, but that about one-half should remain in the soil. For this reason a system of tenure for four years has been proposed.

The conditions to be imposed by the following schemes contain all necessary precautions for the well-being of the forests.

In some instances, portions of such lands have been already dug or ploughed; then, one or two years may suffice for further cultivation. Frequently this is so in the Eastern District; and conditions are imposed as stated in the agreements entered into in the King William's Town division.

Forest Department.

RESTORATION of Forest Land wholly uncultivated, and requiring four years' tillage.

By these presents
 permission is granted to
 for years
 commencing
 terminating
 to occupy and cultivate a piece of land

morgen square roods in extent : being
 a burnt portion of Crown forest, and numbered
 for reforesting, marked out by the diagram hereunto an-
 nexed, on the following conditions :—

Art. 1. The grantee must define the outside boundary of the conceded lot fronting the forest by a ditch six (6) feet wide at the bottom ; the earth being thrown inside his allotment to form a kind of rampart, or this may be substituted by a carefully made sod wall, of dimensions usual for farm enclosures in the country. He must mark out the other sides by a fence of poles and spars. The ditch must be finished by the end of the first year, and be maintained in good order. In the event of the land being surrounded entirely by forest, the ditch above described must be made at the edge of the same forest lot, fifty yards long for each morgen granted.

Art. 2. The ground must be cleaned and put under cultivation during the first year.

Art. 3. After the first year the grantee at his option must either cultivate trees, seeds for which will be supplied to him by Government, in a nursery of say six (6) roods in extent for every morgen granted, at a place to be pointed out by the forest officer in charge, which he must maintain and properly take care of until the expiration of his lease— or pay one pound (£1) yearly per morgen granted.

Art. 4. During the second year at latest, he should sow the bank of the ditch with seeds which the Forest Department considers suitable for making an enclosure, and he must take proper care of it during the remainder of his lease.

Art. 5. Under this arrangement the grantee will enjoy the crops for the three first years.

Art. 6. During the fourth year the grantee should cultivate the ground entirely with crops which require weeding, such as root crops, potatoes, beets, &c., or mealies, beans, peas, &c.

After weeding, or at such other time judged suitable, the Forest Department has the right of sowing and planting forest trees under the shade of the standing crop for the purpose of reforesting the land.

The grantee undertakes not to injure, and to properly take care of the plants so sown or planted, and any other forest trees on the land.

In gathering the crops, the stems and refuse of the plants which have borne the fruit must be left upon the ground.

At the request of the grantee the Forest Department may give permission to cultivate cereals for the fourth year's crop, but only when it is judged expedient for reforesting, and on condition that the grantee will sow or plant at his own expense at that time, and on the same ground, seeds or plants of forest trees, to grow up with the crop, for the purpose of reforesting the land. In such cases the crops must be cut at a sufficient height, so that the forest plants may not be touched or in any way injured.

Art. 7. The fourth year's crop will belong half to the Government and half to the grantee, and will be gathered when convenient.

At the latest, a month before the crop is ready for gathering, it must be valued by two competent men, one appointed by the Chief Conservator, who may either be a forest officer or any other capable person, and the other by the grantee. In the event of a disagreement, the Conservator will hear what they have to say, so that he may afterwards himself settle the matter with the grantee.

If the grantee accepts the award, he will have the choice of keeping the whole crop and paying at once the value of half the crop at what it was estimated, or of leaving the Forest Department to sell it by public auction.

In the event of the grantee not accepting the figure at which it was valued, the Forest Department will sell all the standing crops by public auction, and half of the net proceeds (after deducting all expenses of the sale) will be forwarded to the grantee.

The other half will be applied to fund *re* reforesting expenses.

Art. 8. If the grantee has not completed the required fencing and clearing of the land within one year, he will be liable for a sum of £2, in compensation for neglected work. If the ground is not cultivated during the second

year, in whole or in part, he will be liable for a further sum of £2 in compensation for neglected work.

If the ground be neglected or uncultivated the third or fourth year, he will be liable for a further sum of £4 in compensation for neglected work.

These sums for compensation will be applied to the funds for reforestation.

Art. 9. During the term of the lease the forest officer must see that all the conditions are strictly complied with. In the event of their not being carried out, he will report it in writing, and estimate the damage.

If the grantee refuses to pay for such damage, he will be compelled to do so by all lawful means.

If after three (3) infringements properly proved, the grantee should commit another, the Forest Department will give him notice, and the location will be abandoned without incurring expense immediately the crop is gathered, or at latest a month after the offence has been proved, if at that time the ground is cleared of the crop.

In case of such cancellation the grantee shall be liable for the compensation stipulated (Art. 8) for insufficient labour in the year of cancellation.

Art. 10. It shall be absolutely forbidden to let cattle stray into the forest, and to do this will be a breach of contract tending to the cancellation of the lease.

Art. 11. Every grantee will be responsible for the wood cut or injured in the forest, and for fires within a radius of 500 yards of his allotment. In cases where the offence has taken place within the radius of responsibility of several allotments, the grantees so located will be collectively responsible.

Art. 12. Decaying trees and boughs from the forest will be delivered free to the grantees to make the prescribed enclosures, and also for a cottage if the grantee make request to build one. In such case the cottage is to be built on a spot to be pointed out by the officer in charge, and at the expiration of the lease it will remain the property of the Forest Department, without any compensation to the grantee for it.

The wood to be used must, before being touched, be pointed out and marked by the officer in charge.

Art. 13. The grantee must conform to all the instructions of the Forest Department during the term of the lease, and any refusal or failure in carrying out the conditions will render the contract liable to cancellation, as well as the infringements previously mentioned.

Annexed to this Agreement is a diagram, shewing:—

1. The land leased.
2. The position and breadth of the ditch.
3. The position of the other enclosures.
4. The place where the cottage would be most conveniently built.
5. The place where the nursery would be most conveniently made.

The last two points are stated for information, and could be changed after clearing the soil if the Forest Department saw sufficient grounds for doing so.

I, _____, the undersigned, engage to conform to the above conditions for occupation of the land for which I have applied, if it be granted to me.

Form of Application.

Application is hereby made to the Superintendent of Forests for permission to occupy a piece of land (burnt forest) under the conditions set forth in the Form of Contract for temporary cultivation, for reforesting burnt forests. The land applied for is situate

about

morgen in extent, in the Ward of Ranger

RESTORATION of Forest Land partly cultivated—requiring
one or two years' tillage.

FORM OF PERMIT as granted in the Division of King
William's Town.

Permission is hereby granted to
hereinafter termed the Forest Cultivator, to reside on and
to cultivate for _____ months

acres of worked out, burnt, bare, grass-covered forest land, situated within the boundaries of the forest. This permit is given on the condition that after weeding the mealies or other crops, or at such other time as may be prescribed by the Forest Department, the land be sown or planted, by the Forest Cultivator, with or without the assistance of the Forest Department, with such seeds or plants of forest trees, as may be supplied for the purpose of reforesting the land. When called upon to do so by the Forester, the Forest Cultivator must work with the Forester or Forest Guard day by day till the sowing or planting of his land is finished.

If the Forest Cultivator fails to plant or sow his land with forest trees when called upon to do so; if he injures or fails to properly care for the plants or trees now on the ground, or such as may be hereafter sown or planted on the ground; if he is guilty of any breach of the forest rules and regulations, or of this agreement; if he fails to report any malpractices happening near his residence; if he fails to obey all lawful commands as a servant of the Forest Department for the time being; he hereby agrees to vacate the land, when called upon to do so, by the Conservator of Forests, and to forfeit to Government any crops then on the ground; and he shall further be liable to prosecution for breach of contract, for breach of forest laws or regulations, or under the Masters and Servants Act, or otherwise, as may be deemed expedient.

Cattle for ploughing and milking will be allowed at the following rate:—For every two acres ploughed, one head of cattle up to a maximum of twenty head of cattle. No Forest Cultivator will be allowed to have more than twenty head of cattle on one permit within the forest boundaries, but when the land on one permit has been completely cultivated, the same Cultivator may take out other permits. Forest Cultivators' cattle, grazing within the forest must be branded with a mark approved by the Forester, and must be shown to the Forester branded before entering the forest. Horses or sheep may be substituted for cattle. A Forest Cultivator may keep as many pigs as he likes, but under no circumstances will goats be allowed within the forest boundaries. When a permit is for two years, one-

half of the land must be handed over to the Forester clean and ready to sow or plant at the end of the first year, the remaining half not later than the end of the second year. When a permit is endorsed "substitution allowed," other approved ground may be substituted for the original ground; and at the end of the term any Forest Cultivator who has with permission ploughed land in excess of his agreement may be allowed the first refusal of such ground on a new permit. But under no circumstances can the rights granted on any one permit extend beyond a period of two years, and the grant of any new permit for land held in substitution will be, at the discretion of the Conservator, dependent on the reforesting work performed by the Forest Cultivator. The last crop grown on the land before handing it over for reforesting must be one such as mealies or potatoes, that will leave the land clean.

GOVERNMENT NOTICE.—No. 406, 1883.

Office of the Commissioner of
Crown Lands and Public Works,
10th April, 1883.

The subjoined regulations for the working of the Crown Forests, in the Divisions of Knysna, George, and Humansdorp, to take effect from the 1st June, 1883, are hereby published for general information.

JOHN X. MERRIMAN,
Commissioner.

THE FELLING OF WOOD growing in Crown Forests shall take place with the view of obtaining the following results:—

- I. To fell the quantity of timber equal in amount to that which the forest can yield yearly in perpetuity, so that each year the quantity felled may be replaced.
- II. To assure the reproduction as quickly as possible of the best species on the parts cleared.

With these objects the Crown Forests of George and Knysna will be divided into a certain number of blocks, which will be subject to a regular scheme of management.

In a block subject to this management, and in all those blocks where it is practicable, timber marked each year for felling shall be sold in block, in accordance with the conditions of sale for Crown Forests.

Pending the completion of the details necessary for the establishment of a regular scheme of management for working the different forests, the following regulations for the Crown Forests of Knysna, George, and Humansdorp, are published for general information, and shall take the place of all existing regulations, which are hereby cancelled:—

Regulations.

1. Blocks of Crown Forest permitted to be worked; will be opened in Sections of one-twentieth ($\frac{1}{20}$) of the contents in one or more parts, as may be most convenient to the Forest Department.

2. Each part will be open for two years, the rest of the Forest being closed except in those parts where improvement-fellings shall be deemed necessary; but these parts shall not be open, and improvement-fellings shall not take place unless by special orders of the Superintendent of Woods and Forests.

3. In each Section the trees to be felled will be previously marked, measured, and numbered.

4. Sections of Crown Forests will be opened to the public, but licences will be issued to fell only those trees which are marked, measured, and numbered, and are of the descriptions known by the officers in charge of the Forests, to be in season at the time of year when applied for, and at no other.

5. The following shall be the rates of charge for Licences to cut timber and wood in the several Forests abovementioned, viz. :—

TIMBER VALUED STANDING.

	Per cubic foot.	£	s.	d.
Upright Yellowwood		0	0	3
Outeniqua		0	0	1
Stinkwood		0	1	0
Ironwood, circumference, 7 ft. or more		0	0	1
„ do. less than 7 ft.		0	0	3
Assegai, do. $4\frac{1}{2}$ ft. or more		0	0	1
Do., less than $4\frac{1}{2}$ ft. ...		0	0	3
Saffron		0	0	3
Kershout		0	0	2
Red Pear		0	0	3
Witte Do.		0	0	3
Hard Do.		0	0	3
Vlier		0	0	1
Guar		0	0	1
Witte Els		0	0	2
Red Do.		0	0	3
Beukenhout		0	0	2
Essenhout		0	0	2
Wittehout		0	0	1
Other timber not specified		0	0	1

	£	s.	d.
Poles from 6 inches to 10 inches in diameter per running foot ...	0	0	1
Spars from 4 inches to 6 inches in diameter per 100 running feet ...	0	0	6
Firewood, per load, green ...	0	5	0
Do. Do. dry ...	0	2	6

6. Measurement of circumference will be taken at four feet from the ground in the case of seedlings; but where trees are off-shoots, they will be measured four feet from the point of separation from the old trunk.

7. A load of firewood is the quantity necessary to fill a wagon of twenty feet in length.

Green firewood is restricted to trees damaged by fire or otherwise valueless as timber-trees.

Dry firewood is to consist of any description of tree or branches actually dry.

8. A licence to cut firewood or spars shall hold good for a period of two days.

No timber-tree mentioned in paragraph 5 shall be cut for spars or firewood unless specially stamped previous to felling.

9. Every licence must specify the description of timber required; the number on the tree to be felled, and its measured contents of serviceable timber, also in what part of the Forest the timber is to be procured, and the number of men intended to be employed in cutting the quantity specified.

10. Every timber licence will be for one hundred cubic feet (more or less). *

11. Licences to cut timber in any Crown Forest will be obtainable at the office of the Conservator of that Forest, and of such Forest officers as may be authorised to issue them.

* From the combination of the three articles 9, 10, and 14, it results that a licence is granted for each specified tree (article 9) taken in its entirety (article 14) and that the price is fixed according to the number of cubic feet of sound wood the tree contains (article 10 and 14). The whole quantity of wood furnished by the tree belongs to the bearer of the licence.—Note by Superintendent of Woods and Forests.

12. When a licence has been obtained to cut timber in a certain part of a Crown Forest, it must be presented to the Ranger or other proper officer of that part, previous to any wood being cut, on pain of forfeiture of the licence, and in addition to any other penalty which may be imposed for breach of these Regulations. The officer aforesaid will then, unless the licence has been issued by himself, register and endorse the same, and will in any case return it to the holder, who will then be at liberty to cut the wood specified in his licence.

13. The greatest care must be taken by the holder of the licence that no damage be done to young trees in the process of felling and removing his timber; and carelessness in this respect will render him liable to pay compensation at the following rates for the damage done:—

Trees of circumference less than three inches.

	s.	d.
Stinkwood	0	3
Outeniqua and trees at threepence per cubic foot, according to the rates established by Section 5 of these Regulations	0	2
Others	0	1

Trees of circumference of three inches and more; for every inch of circumference.

	s.	d.
Stinkwood	0	2
Outeniqua and trees at threepence per cubic foot, according to the rates established by Section 5 of these Regulations	0	1
Others	0	0 $\frac{1}{2}$

No timber shall be removed from the place where it was felled, without having been previously inspected, measured and marked by the Ranger or other proper officer, who will note on the back of the licence or in his register-book, the contents of the timber and the date of its inspection. The measurement must include the whole length

of the tree—cross-cut or not. In case of a difference of a tenth ($\frac{1}{10}$) or more between such measurement and that of the standing tree, an adjustment of the difference can be made either by a payment equivalent to the value received in excess, or by a subsequent delivery of timber equivalent to the short measure obtained by the licensee.

15. After the felled trees have been measured, they may be cut up in the forest or removed to the saw-pit; but the cut-up timber shall not be taken away from the forest or saw-pit until the Ranger or other proper officer has stamped or marked the same in such a manner that the stamp may appear upon each piece.

16. After the final inspection the woodcutter will be at liberty to remove his timber either in block or in plank. If he prefer the latter, six days will be allowed for sawing one hundred (100) cubic feet; but should he intend to take out further licences and wish to defer the sawing until after the felling season is over, he must collect the blocks into one spot and so arrange them that the Forest officer's mark may be clearly visible on each.

17. Each holder of a licence to cut one hundred cubic feet, will be entitled to take sixteen oxen to the forest and to graze them for fourteen days on the adjacent Government ground or other lands under servitude for grazing wood-cutters' cattle; after which period the oxen must be removed from the grazing ground till the wood is ready to be taken away.

This regulation will be relaxed only in case it shall be proved that the men have been prevented from working by sickness, accidents, or bad weather.

18. Any holder of a licence contravening any of these regulations shall forfeit his licence and all wood felled and not removed at the time of such forfeiture.

19. Form of Licence :—

“CROWN. FORESTS.

“*Licence to cut Timber.*

See opposite page.

Timber. FOREST DEPARTMENT. [A.]

Licence No.

Division of

Permission is hereby given to
to cut in

"Triage" of

Crown Forest of { Series.
Section.
Viree.

the Trees as below :

	No. of the Tree.	Species.	Con- tents cub. ft.	Rate.	Value.	Amount paid	Period.		Remarks.
							From	To	
1									
2									
3									
4									
Total...									

Number of Men employed for this purpose.

Number of Oxen to be taken to the Crown Forest.

This Licence is to be presented to the Forest Guard of "Triage"
No., previously to any Wood being felled or removed.

The Trees must be cut low down, as close as possible to the stamp
mark at the foot, care being taken to leave the stamp mark on the
stump.

The greatest care to be taken that no damage be done to other
Trees, according to the Conditions of Art. 13 of the Regulations.

Any Breach of the above Conditions will entail Forfeiture of the
Licence and other Penalties which may be imposed for Breach of the
Regulations.

Licence paid, £.

Conservator,

Conservator's Office,, 18....

Poles, Spars,
Firewood.

FOREST DEPARTMENT.

[B.]

Licence No.....

Division of.....

Permission is hereby given to
to cut in

"Triage of.....

Crown Forest of..... { Series.....
Section.....
Virees.....

TREES AS BELOW.

Nature of the Licence.	Unit of Measure- ment.	Number of Units.	Rate.	Value.	Amount Paid.	Period.		Remarks.
						From	To	
Poles.	Running feet.			}				
Spars.	Ibid.							
Firewood.	Load.							
Total.....								

No Yellowwood, Ironwood, Stinkwood, Assagai, Witte Els, Saffron, Essenhout, Witte Pear, Hard Pear, Red Els, Sneezewood, Olivenhout, and Kafir Plum, shall be cut for Kraals, Huts, Houses, Poles, Wagons, or for any other purpose, unless previously marked for felling by the Forest Department.

This Licence is to be presented to the Forest guard of "Triage," No..... previously to any wood being cut, on pain of forfeiture of the Licence and other penalties which may be imposed for breach of the Regulations.

This Licence is to be returned to the Conservator or other proper officer of that portion or "Triage" at the expiration of the period for which it is granted.

No wood is to be cut near the sources of Springs or Rivers, under any pretext, unless wood so situated has been specially marked for felling by the Forest Department.

Licence paid £.....

Conservator's Office,, 18..

Conservator.

